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SPECIES

NOT TRANSMUTABLE

NOR

THE RESULT OF SECONDARY CAUSES

BEING A CRITICAL EXAMINATION OF

MR. DARWIN'S WORK ENTITLED 'ORIGIN AND VARIATION OF SPECIES.'

38389

BY C. R. BREE, ESQ. M.D. F.L.S.

PHYSICIAN TO THE [illegible] AND CORRESPONDENT [illegible]

Author of the [illegible] of Europe, not observed in the British [illegible]

Naturam expellas furcâ, tamen usque recurret.

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TO

GEORGE J. ALLMAN, M.D., DUB. AND OXON.,

F.R.S.S., L. AND E.,

REGIUS PROFESSOR OF ZOOLOGY AND GEOLOGY

IN THE UNIVERSITY OF EDINBURGH,

THIS LITTLE WORK IS DEDICATED,

BY HIS FRIEND

THE AUTHOR.

PREFACE.

The following pages were written some months ago, and their publication has been delayed by circumstances to which I need not further allude. I offer the book now to the consideration of the public, with a perfect consciousness that it has many defects for which I must claim indulgence. The subject is one of deep importance, much more so indeed than would appear to many, from a thoughtless perusal of the work criticised. I trust I have dealt with the book fairly. I entirely disclaim all personal feeling in the strong language I have sometimes felt bound to use. No one has derived greater pleasure than I have in past days from the study of Mr. Darwin's other works, and no one has felt a greater degree of regret that he should have imperiled his fame, by the publication of his treatise upon the "Origin of Species."

C. R. B.

Colchester, Sep. 14th, 1860.

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SPECIES NOT TRANSMUTABLE.

CHAPTER I.

"THEREFORE I cannot doubt that the theory of descent with modification embraces all the members of the same class. I believe that animals have descended from at most only four or five progenitors, and plants from an equal or lesser number."

"Analogy would lead me one step further, namely, to the belief that all animals and plants have descended from some one prototype. But analogy may be a deceitful guide. Nevertheless, all living things have much in common in their chemical composition, their germinal vesicles, their cellular structure, and their laws of growth and reproduction. We see this even in so trifling a circumstance as that the same poison often similarly affects plants and animals; or that the poison secreted by the gall-fly produces monstrous growths in the wild rose or oak tree. *Therefore I should infer from analogy that probably all the organic beings which have ever lived on this earth, have descended from some primordial form into* which life was first breathed."—DARWIN, on the Origin and Variation of Species, page 480-4.

THERE can be no doubt about the meaning of the above quotations. They express clearly and with startling confidence the result of Mr. Darwin's investigations into the origin of species. But whatever may be their significance to the philo-

sophic naturalist, these results have a still greater interest to those who pass the pleasantest hours of their life, in studying Nature as she exists in the beautiful world by which we are surrounded.

To the former they revolutionize all the theories upon which his principles of classification are based; to the latter they are destructive of all that he has ever contemplated of the harmony—the adaptation—the design—which he has dreamt that he saw in created things.

It cannot therefore be deemed an unnecessary or uncalled-for task, to enquire critically into the grounds upon which such conclusions have been formed. The minds of the students of Nature of all classes are strongly imbued with the idea, that living things have been specially created to serve certain purposes in the world—that they in fact represent the ideas or constituent parts of the great thought by which they were called into being—that they are distinct, and though variable, yet immutable organisms—not changing one into another by any secondary law or laws, but existing as they were first produced; carrying out the Design by which their structure was adapted to their mode of life and position in the world.

It is upon no slight grounds that such a belief will be surrendered. There is so much evident Truth in the congruity of Nature—so much that is convincing in its harmony—so much that speaks in clear and unmistakeable language of a Great First and Final Cause—that the mind instinc-

tively repels anything which attempts to weaken its convictions, or demolish the groundwork of its faith.

And before this can be finally accomplished, there must be not only a rational and well-argued and convincing case made out by the assailing party, but there must be a complete change in the human mind! The highest powers of its reason, those by which the greatest triumphs have been effected, its inductive faculties must give way to a cold but implicit belief in assumed facts, which that reason clearly tells him never could have been realities.

Mr. Darwin has presented us with what he considers the first of these alternatives. I am either unreasonably sceptical, or the change alluded to has not been effected in my mind. I have read over his book most carefully, and I am bound to confess that I am a stronger believer in a first cause and a special creation than ever; for I am now fortified with what I conceive to be the failure of a man of deservedly high reputation to convince me that I am in error.

In the passages above quoted from Mr. Darwin, he states that he "*believes* that all animals have descended from at most only four or five progenitors, and plants from an equal or lesser number;" and subsequently he "*infers* that probably all organic beings have descended from some one primordial form into which life was first breathed."

Let us briefly examine the inference first.—

If every living thing has descended from one form, it is quite clear that man was not a separate creation. Originating in some undescribed and unintelligible primordial organism, he has been progressing through countless ages by the principles of "natural selection," "modification of form," and "divergence of character," until having passed through the various phases of organic life, he ultimately became a monkey, and then—a man.

Now there is no possibility of getting away from this position, if Darwin's book is true. The changes taking place through "countless ages," myriads of years in fact before the oldest known geological epoch, the latter being itself a period too immense for human intellect to grasp!

I need not stop a moment in endeavouring to prove the vast and fearful interests which are involved in such a conclusion. We are told that in discussing a scientific question, (and I agree in the propriety of the rule,) that we must not mix it up with proof which may be obtained from the Sacred Writings. But the question as I have placed it, or rather as Mr. Darwin has raised it, has gone far beyond the limits of a scientific discussion. Mr. Darwin, it is true, has carefully avoided opening the wider issue by reference to Biblical authority, but he has arrived at a point which has struck at the foundation of all the great truths which the Bible teaches, and therefore it is incumbent upon any one who enters into

a discussion of the question, to demand clear and undoubted *proof* of the doctrines upon which it is founded.

Now it is because I consider Mr. Darwin's position untenable—his facts doubtful—his reasoning unsound—and his deductions untrue, that I venture, with a deep sense of my own shortcomings, to enter the list with him in a fair and open manner, and to state distinctly, but without flinching, that I think the grounds of my disbelief can be clearly sustained. But it may be said, why argue from Mr. Darwin's inferences? Let us therefore examine for a moment his conclusion.

It must be borne in mind, as will appear more clearly when I come to analyze his arguments, that Mr. Darwin considers all *species* of one *genus* to have arisen from one parent, all *genera* from one representative of an *order*, and all orders from one member of a class; and all members of a class from one member of a *sub-kingdom*. Here he stops short in his "conclusions;" going one step further in his "inferences," and believing that all "sub-kingdoms" arose from one sole representative.

It is very essential to bear in mind that, according to this theory, there has been a *progressive* development of animal form. Now the animal kingdom is at present divided by naturalists into five great divisions—the *Vertebrate*, the *Molluscous*, the *Articulate*, the *Radiate*, and the *Protozoa*, sub-kingdoms. Of these man is the head

of the first, and consequently is the highest development of Mr. Darwin's original primordial vertebrate form. He was not then, according to this doctrine, specially created.

It will be seen further on, that Mr. Darwin arrives at his ultimate typical form, not by any special design or creation, but that in the course of myriads of ages, varieties of form occurring "accidentally" or otherwise have given certain animals a superiority over others in the "struggle for existence," which is the great moving spring at the root of all his speculations. It is then quite clear that if these views are correct, it matters but little whether Mr. Darwin gives us four or five progenitors, or only one. In either case he denies a special creator either to plants or animals, and thus at one blow destroys all that we have so long held and cherished among the riches of our knowledge—that beautiful adaptation of structure to its varied uses, which some have called design, life, motion, development; which others have called evidence of Natural Religion; and above all, man himself, with his attributes—sensation, thought, consciousness, in a word reason—all these are swept away as a proof of special creation;—they are but the results of fortuitous variation, acting without order or even natural law!

But differing, as I do, from Mr. Darwin in his interpretation of facts, and denying, as I do, the soundness of his premises and the correctness of his deductions, I am quite willing to admit that he

never intended that the theory he has endeavoured to establish, should carry with it the fearful conclusion to which I have alluded. A recent writer in one of our popular weekly publications contends that there is nothing irreligious in Mr. Darwin's views, and that a Great First Cause may act with as much design by secondary means as he can by special creation. In other words, this writer would have us believe that the first primordial form, from which all others sprung, contained within itself the elements of perpetual change, each variation being adapted to the ever-varying condition of the world. Now if this were true, variation of species would be a constant natural law acting from all time with definite pre-ordained precision and regularity! But Mr. Darwin does not lay claim to that which is in itself a manifest absurdity, for the very word variation implies a type or normal form, from which the species varies.

Whatever however may be the *modus operandi* of Mr. Darwin's law of variation, in affecting the astounding results which he ascribes to it, there can, I think, be no doubt that we are entitled to have something like evidence of the correctness of his facts, and the soundness of his arguments.

If Mr. Darwin had limited his work to the simple question of the "Variation of Species," I could readily have joined in much of the praise with which the book has been received by some who have a knowledge of Comparative Anatomy, and by a great many who are entirely ignorant

of it, as is evinced by their reviews. But when the question is widened so as to attempt to prove that by a new and partial law, a fish, a reptile, a bird, or a mammal are merely different expressions of the same thing—mere modifications by "natural selection" and "divergence of form" of the same primordial organism, he opens a question so vast and so utterly opposed to all our preconceived notions—so contrary, as I conceive, to all the knowledge which Anatomy and Physiology teach us, and so utterly destructive of all belief in the constant operation of a Great First Cause, that it will be readily conceded before we assent to such a doctrine, we have a right to demand that it should be founded on some kind of proof. Now I have carefully read over Mr. Darwin's work, and I cannot from beginning to end find one atom of proof of the *transmutation* of species, upon which the integrity of the whole doctrine depends.

There is a great deal said, it is true, of such arguments as are to be derived from the ready belief that a flying fish might be converted by "natural selection," etc., into a bird! How the flying Lemur might have its membranous appendage changed into the wing of a bat! How the eye of the eagle might have been "modified," and "varied," and developed from the black pigmentary spot of the crustacean; or, how a bear swimming about with open mouth to catch flies, might have been transmuted in due course into a mighty whale! But when we ask for proof—for facts

to argue upon—for reasons for believing—for the scientific basis of a rational induction—alas! we get nothing but the doctrine of "natural selection!" of "modification of form!" of "divergence of character!" of "correlation of growth!" or we are coolly referred with inimitable equanimity to that dark unfathomable abyss, the "Imperfection of the Geological Record!"

That domestic animals of the same genus will modify, as Mr. Darwin has shewn, no one ever doubted. That climate, habit, difference in food, and careful and judicious crossing will alter the races of animals, as to certain unimportant points of structure, is a truth which no naturalist ever denied. But the pigeon reared by the fancier is still a pigeon; the short-horned ox and the Devon are still most unmistakably bovine; the racer and the cart-horse still proclaim their brotherhood; the greyhound and the spaniel are still dogs! Granted, if you will, they may have been derived from the same stock. Yet how immensely different is the question of such a modification from that which by any process of natural change, could convert the water-breathing fish into the air-breathing mammal, or the bird with air-filled bones—(so beautifully adapted to give it lightness and buoyancy in the atmosphere,) and its complex flying apparatus, into the crawling reptile, the fish, or the quadruped!

Not only is there no proof tendered of anything approaching to such conversions as these, but the author has been forced to indulge in speculations

the most improbable. For instance, Mr. Darwin, with commendable candour, admits that his whole theory tumbles to pieces unless the world has existed for unnumbered ages before the silurian epoch—the lowest fossiliferous stratum known to geologists. It is clear that the hypothesis must fail if this is the "dawn of creation," for we find numerous fossil forms presenting a tolerably high organization. Below this there is no record of life. The time which geologists compute must have passed since this period, is far too vast for the mind to grasp. One of the latest geological writers however, Mr. Mackie, in his "First Traces of Life on the Earth," gives us some data upon which a tolerably approximate calculation may be formed.

"The greatest amount of sediment which, according to our present information, can be permanently laid down in our deep waters over the range of our present seas, would probably not exceed in the aggregate, including even our littoral accumulation, a coating of more than three inches thick in ten thousand years; and yet we have at least a minimum thickness of upwards of eighty thousand feet consolidated sedimentary rock to explain as the result of natural agencies in past time."—(Page 126.)

Thus we may calculate from the *minimum* thickness that at least three billions two hundred millions of years have passed since the first known living organism was deposited in its rocky grave! And yet it is absolutely necessary for Mr. Darwin

to assume that this is but a fragment in the world's history!

But is there any proof of an animated world prior to the silurian epoch?—Not a vestige. And yet we are told by Mr. Darwin, to believe that an equally long period at least occurred before, the evidences of which are still buried beneath the sea; and upon this merely gratuitous assumption we are at once to surrender our belief in special creation and design!

I may be permitted however to remark here, that two billions and a fifth of years is no mean fraction of time. If we count two hundred a minute, it will take us nine years, or nearly, to count a billion. Surely this is something in the record of the past; and yet it tells us nothing of the transmutation of species!

In the first of all fossiliferous rocks—the Cambrian, what do we find?—Sertularians, Annelidans, and Trilobites, representing the Radiate and Articulate sub-kingdoms of modern naturalists. Some traces also of sea-weed have been discovered by Mr. Salter, at Moel-y-ci, near Bangor, and others have been described in Skiddaw slates by Professor Mc'Coy. (Mackie, p. 149.) When we get a little higher up in the scale—into the third silurian, we find the forms much more numerous. We have mollusca represented by well-developed and peculiar species in almost all its divisions, namely, Polyzoa, Brachiopoda, Lamellibranchiata, (Holostomatous Gasteropods, allied to our snails,) Cephalopoda, containing representatives of the

beautiful nautilus, which skims along the surface of our own seas, and the delicate Cleodora, one of the most lovely and fragile monuments of the past. The class Annulosa is represented by some remarkable forms. Star-fishes like those we can pick up on our own coast, only differing in some real or imaginary structure; the curious Crinoid still represented in our fauna, and those wood-louse-like crustaceans, the Trilobites, of which Burmeister and the Ray Society have given us immortal representations.

It is clear then that Mr. Darwin's world could not have commenced here, for we have a host of once-living things in these Cambrian and Silurian rocks, representing plants, and four out of the five great divisions of the animal kingdom.

Well, to get over this difficulty, Mr. Darwin creates in his imagination another world of an indefinite length, but at least as long before the Silurian as the time which has passed away since. I must beg the reader's particular attention to this imaginary unknown geological formation; but for the present I will leave it, and say a word or two about the immense record of which, thanks to the researches of Sedgwick, Murchison, Lyall, and others, we do know a great deal. And what does it tell us of the transmutation of species? absolutely nothing!

Through this immensity of space animal life has neither diverged in form to any amount, or has had differentiated by the "law" of variation any additional organs. *It has not become trans-*

muted. There is not in this three billions and two hundred millions of years *a single form which Mr. Darwin can bring forward as transitional from one phase of being to another.* The wonderful records of geology display a succession of life during the past period which it occupies, as remarkable as it is positive in its details. We do not, it is true, as some have erroneously inferred, and, as according to Mr. Darwin's views, we ought to have done, find a gradual succession of the lower into the higher organism. On the contrary, there are evident marks of degeneration in some forms, while others are exalted. We see in fact, perfect adaptation of structure to the mode and the means of life. Where now shall we see the modified representative of the huge Saurian which lived in an atmosphere, and in a condition of the earth, formed, I will not say specially for, but in accordance with its peculiar structure. Look again at the remains of the Mammoth, or the Mastodon, and other allied monsters, which have long since become extinct. They do not speak of a progressive development, or a passage in the transition of a lower to a higher form!

But like every other class of organisms in the geological record, these extinct animals tell their own tale, and display in language which no one can misunderstand, that in every great period of geological history the world has been peopled by creatures *adapted to its physical and climatic condition, and that this has been done by distinct acts of special creation,* by Him whose wisdom

our finite minds are too apt to interpret and criticise. Instead of studying the works of nature with the light which we possess, and endeavouring to discover by the aid of the highest and most cultivated reason, the different steps in the great plan of creation; Mr. Darwin, and those who follow him, have erected a system of their own, which, without displaying the power and the beauty of Infinite Wisdom, has from beginning to end marked upon it the imperfections and often bungling creations of a human intellect.

It is the object of the following pages to shew that Mr. Darwin's case is not proved, and that consequently it cannot supersede that theory of special creation, of which we have the most convincing proof.

Before we examine however more minutely into the grounds upon which Mr. Darwin's whole theory is based, let us consider for a moment two propositions.

First, What does Mr. Darwin's theory really mean?

Most people in these reading days are aware that previous to the appearance of Mr. Darwin's book, there have been brought before the world two great speculations about the origin and development of species. Lamarck, like Darwin, a great naturalist, and who had a more intimate acquaintance with species than perhaps any other man of his day, conceived the extraordinary notion not only that all living things originated in one primordial form, but that they were developed

in successive ages into different orders and classes, by a change produced in the animal from use. That is to say, an animal, whether mollusk, fish, reptile, or bird, might by the constant use of any one organ produce a permanent alteration in it, and thus become gradually changed into a creature having altogether different habits, form, functions, and development.

In 1854 was published the "Vestiges of a Natural History of Creation," in which the author admitting that there was a glimmer of truth in the theory of Lamarck, proceeded to demolish it by endeavouring to prove that the Creator peopled the earth with living forms, not at one time only, but at successive periods, and not by actual creation, but by the operation of a certain law, by which development in living structures was altered or arrested at different points, thus producing transmutation of species, and adapting a form living, we will say in water, to one living in air; thus believing, like Lamarck, in ultimate results, but differing as to the *modus operandi*.

The author of the "Vestiges," however, went further than Lamarck in believing that his primordial organism arose, not by a positive and distinct act of creation, but also by a law, still thought to be in operation, through which animal or vegetable forms were brought into being by the mere commingling under electrical or other forces of the chemical elements of which they were composed; in other words, he believed with Burmeister and others in "spontaneous generations."

Now Mr. Darwin goes with Lamarck and the "Author of the Vestiges" in the main and important parts of their theories. But he goes further, and believes not only in the transmutation of species, but also of families, orders, and classes, and also in the origin of all in one primordial form, "into which the breath of life was first breathed."

The only real difference between Mr. Darwin and his two predecessors, is this:—that while the latter have each given a mode by which they conceive the great changes they believe in have been brought about, Mr. Darwin does no such thing. Reduced to its simplest expression, he believes in a law of variation not acting uniformly, but producing here one form, there another,—which said forms having acquired through this law an addition to, or alteration in their structure, have transmitted this peculiarity through a series of ages, by which time another change has taken place in one or more members of the descendants of the altered animal, which, again passing through a great number of generations, altering gradually through each, becomes again changed, and that this process, acting upon all organized forms, has, during unnumbered ages, produced the different forms of man, quadruped, bird, reptile, fish, mollusk, annelidan, radiata, protozoan, and plant. He further believes that there never has been any special act of creation, except that of the first undescribed and imaginable form!

Now let me ask any candid inquirer, in what does this theory differ from that of the "Vestiges?" Why, in reality, I answer, nothing, except in less plausibility. The author of the "Vestiges" says, development is arrested or altered, and that thus forms are changed by what he calls natural law. Mr. Darwin merely re-states the fact without offering any explanation. He says that there is a law of variation throughout nature. What can this be except a law of development? The two ideas are in fact precisely the same, although expressed in different language; the one shewing how his law of development produces varieties, the other merely shewing in the most ingenious way imaginable, how these varieties ultimately become different species. The one believes his law of development has been brought into operation by Creative Will at different periods of the earth's history. The other that that law is a principle acting inequally, irregularly, or fortuitously.

Again, in what does Mr. Darwin differ from Lamarck? They both believe in the same results; but while the latter has given a means by which he thinks his changes were brought about, the former simply takes those changes, that is to say, variations, and endeavours to shew how they produced, by progression through endless ages, all the classes of living things in the world!

The theories of Lamarck, and the "Vestiges," have been long since condemned as unsound, by all the leading naturalists of the age. But Mr.

Darwin's have been received with much more favour, although, I think, the same arguments which condemned the former may be brought with stronger force against the latter. Mr. Darwin is a man of high reputation, and his work is written with fairness and candour, and is submitted full of doubt from the author's pen. There are difficulties which Mr. Darwin knows full well must be surmounted before his work can be received as the development of a sound theory. These objections he has himself for the most part anticipated and combated; but before we look into this part of the subject, it may be profitable to say a few words upon,—

Secondly, Does Mr. Darwin's law of variation actually exist in nature?

That species vary I fully admit: that they do so by the operation of a natural law, I am equally confident is not true. It is quite clear that a natural law cannot be special or selective, for it would thus at once lose its claim to the title of a law. If you take a pigeon, or an ox, and alter its habits of life, you place it under circumstances it was never designed to occupy. You pamper it with food of the finest quality, and just as the larva of the worker bee is fed up into greater size, and from a state of barrenness to one of fertility; so the pigeon will become altered both in size and colour, and form and fertility. In its wild state the blue rock builds once or twice a year; when you have domesticated it, and crossed it, and altered

its mode of living, it will breed seven or eight times a year, or oftener. I by no means admit that you could convert it by this means into a tumbler or a carrier; still less do I hold that you could by any means change it into an elephant or a whale, but I mention the fact here to draw attention to the immense difference which there is between the varieties produced by domestication, and those which occur in a state of nature. Grow a plant in a strong, rich, highly-manured soil, and note how different it will be from that grown in a poor one,—how much more inclined to sport into varieties. The fact is too obvious and well-known to require illustration.

How variable also is the plumage of birds kept in confinement. Look at our domestic ducks, or our barn-door fowls, and compare them again with the wild duck or the pheasant. This, I contend, is an abnormal effect produced by altered treatment. If it were the result of a *natural* law, it ought to obtain equally with animals or plants in a state of nature, and this I entirely deny. The naturalist gets a great number of what he terms closely-allied species, and immediately the fact is seized hold of to prove a law of variation. But did it never occur to Mr. Darwin that the rules which naturalists often follow in determining species are very arbitrary. Are not forms frequently associated together or separated from each other by characters which have no real importance?

Nothing, in fact, can be more absurd than

the modern system of species-making. A man, often without any knowledge of comparative anatomy, the only sound basis of classification, will take a series of birds or insects from a country of which he personally knows nothing. He separates the former according to some conspectus, and then noting a white band here or a black one there, or a difference in size, immediately makes it into a species, invents for it a name as long as its wing, founded doubtless upon very correct Greek, puts his own name to it as its discoverer, and sends it forth to the world as a newly-determined species. A year or two after a naturalist visiting the country finds that after all the species was merely a local variety, the effect of climate and food, which, if left alone, would have gone back to its parent form again.

Now this is going on every day. To look well these species must have tremendously long Greek derivations to distinguish them. All the old sensible expressive names employed by such men as Temminck are tabooed as not being "up to the state of science." This has been one fruitful source of the present state of natural history; all our species are in confusion, and of course the circumstance is gladly laid hold of by Mr. Darwin as corroborating his views.

Be this as it may, a really good naturalist will always detect the species in the variety. How is this? Simply because the variety always carries with it some character or other which

links it with the species. If variation were, as Mr. Darwin suggests, a law of nature, the change ought to be so constant and so marked as to enable the naturalist to say, "This is an organic permanent change, brought about by the operation of a natural law: it is not functional, produced by excessive or deficient nutriment, or by crossing with another species. No! I recognise in this organism merely a change which I see produced by a law in operation everywhere. This, therefore, is not a variety at all; it is a distinct species;" and he would name it accordingly.

But is this the fact? Is it not notorious that though varieties do occur, often most numerously, yet the *event is entirely exceptional*. What are they compared to the myriads of well-marked species which, if left alone in the condition designed for them in nature, pass on through thousands of years unaltered? Where, then, is the law of variation? You can only illustrate variety from the effects which you abnormally produce in confinement. And how weak are the arguments often used even to prove this.

Mr. Darwin says that fancy pigeons are all descended from the common blue rock, and many other naturalists hold the same opinion, because the peculiar marks of the "blue rock" now and then appear in the wings and tails of the pouter and the short-beaked tumbler. But surely this may have arisen equally well from an accidental cross with the domesticated blue rock,

which is the favourite bird for making pies, and kept in almost every dove-cote. Mr. Darwin says it is incredible that this should have produced the "sport," or that these different varieties of pigeons were descended from aboriginal stocks, having similar markings.

I really do not think that this part of the question is worth an argument. It only illustrates, even if Mr. Darwin's hypothesis of this original descent from the blue rock were true, that you may, by domestication and careful crossing, produce varieties having but little resemblance to their original parent. But the organization, the structure, the functional life, the sum-total, in fact, of what constitutes a pigeon, does that differ in the two birds? Not in the slightest. There is no divergence towards anything else but a pigeon. And surely if this crossing and domestication has been going on for thousands of years, (Mr. Darwin admits a term of five thousand years,) we might in that time have had the development of some abnormity of structure, which would have shewn a "divergence of form," tending either towards the mammal above, or the reptile beneath it in the scale of existence! Mr. Darwin, however, conceals these mysterious transformations in the dark, unknown, and fathomless past.

But the question suggests another idea. If not the slightest vestige of such a change has been visible in the pigeon by "variation under domestication," has there been any divergence

ever discovered in the wild blue rock during the last five thousand years, under the operation of Mr. Darwin's law of what he terms "natural selection?" Why, surely if man could by crossing and selection produce such a variety of forms, the other great principle, though acting slower, ought to have borne some fruit? Why have we not descendants of the blue rock in the wild state with the form of the "short-beaked tumbler," the "pouter," or the "fantail?" But that there are none such known, Mr. Darwin adduces as one of the strong points of his theory of their origin. No! the "blue rock" still keeps its place unaltered and unchanged in the great scheme of nature, adapted to its position by a wise Creator. Designed to fulfil a destiny in the living world, it has remained unchanged in habit and structure, since it came into being by the fiat of an all-omnipotent and never-dying God.

And so I believe with the rest of nature. We shall, by and bye, as the arguments open out, see the groundless nature of this natural selection myth. It is not, in fact, a force in nature at all. It is not design, for *that* would spoil Mr. Darwin's theory altogether. It is not a natural law, for this cannot act partially or by chance. As well might we say the liver secreted bile one day, and the kidneys the next. It cannot be a principle attached to matter when first created, or else it would be guided by natural law, which we have seen it is not. It cannot be a force of "necessity," for there is not one

single proof to be advanced in favour of such a principle or force, as attached to living beings. If it is anything, it is *mere chance*,—giving to the stronger, power over the weaker,—and such, I believe, is all that can be claimed for, or in fact all that is meant by "natural selection."

CHAPTER II.

LET us now look a little closer into some of the arguments by which Mr. Darwin's ingenious hypothesis has been built up.

The work is divided into fourteen chapters, and we are told it is only an abstract of a much larger book, to be published hereafter. The first chapter treats of "Variation under Domestication." The causes of variability Mr. Darwin considers, (after alluding to the difference of life and habits, and excess of food,) to be an alteration in the reproductive elements, causing a difficulty in inducing the animal to breed in confinement. "Nothing is more easy than to tame an animal, and few things more difficult than to get it to breed freely under confinement even in the many cases where the male and female unite." And he illustrates this as follows:—"Carnivorous animals, even from the tropics, breed in this country pretty freely under confinement, with the exception of the plantigrades, or bear family; whereas carnivorous birds, with the rarest exceptions, hardly ever lay fertile eggs."

With singular inconsistency Mr. Darwin admits in the next passage,—"When on the one hand we see domesticated animals and plants, though often weak and sickly, yet breeding quite freely under confinement; and on the other hand, when

we see individuals, though taken young from a state of nature, perfectly tamed, long-lived, and healthy, (of which I could give numerous instances,) yet having their reproductive system so seriously affected by unperceived causes, as to fail in acting, we need not be surprised at this system when it does act under confinement, acting not quite regularly, and producing offspring not perfectly like their parents, or variable."—(Page 9.)

Now this, which is Mr. Darwin's first cause of variation, is a perfectly gratuitous assumption. Ask any canary or pigeon-fancier if he finds any difficulty in getting his birds to breed, and then ask him if, *being sure of his stock*, is the produce liable to great variation? All breeders are aware that error in *food*, and *breeding in and in*, are the great causes of *variation;* and both these are unnatural, and therefore not likely to serve the law of variation theory in *a state* of nature. That there should be a difficulty in inducing birds or beasts of prey to breed in confinement is not at all astonishing, when we reflect upon the altered condition of life to which they are exposed. But how can this in the slightest degree be brought to bear upon any assumed alteration in the reproductive organs in a state of nature? In the forced and unnatural condition to which they are subjected, it cannot for a moment be a matter of surprise if the young, when they do breed, are not always of normal form. The garden "sports" do not bear upon

the question at all, inasmuch as they are generally the result of crossing.

The passage about habit as affecting variation is very brief, and might be passed over, were it not for an extraordinary Lamarckian doctrine which it contains. "Not a single domestic animal can be named which has not in some country drooping ears; and the view suggested by some authors, that the drooping is due to *disuse of the muscles of the ear, from the animals not being much alarmed by danger, seems probable.*" Now, of all animals in the world, I should think our domestic ox, horse, ass, or mule, are, on the whole the least alarmed by danger. Why have they not drooping ears? Or if Mr. D. considers the motion which the ears of these animals possess, and which is useful for many purposes, as drooping, then the most timid of our wild quadrupeds, the hare, must be said to have a drooping ear also!

The next cause of variation treated of by Mr. Darwin is correlation of growth, instancing the following examples:—1.—Breeders believe that long limbs are almost always accompanied by an elongated head. 2.—Cats with blue eyes are invariably deaf. 3.—White sheep and pigs are differently affected from coloured individuals by certain vegetable poisons. 4.—Hairless dogs have imperfect teeth. 5.—Long-haired and coarse-haired animals are apt to have, as is asserted, long or many horns. 6.—Pigeons with feathered feet have skin between the toes. 7.—Pigeons

with short feet have long beaks, and *vice versâ*. And these are the peculiarities which man selects or avoids to cause variation in his domestic species; for, according to Mr. Darwin's theory of correlation, if we select any peculiarity in an animal, we unconsciously modify other parts of structure!

Now, as these preliminary parts of Mr. Darwin's work are all links in the hypothetical chain which he has worked, it may be necessary to notice some of these so-called correlations of growth.

This reciprocal relation of parts in the growth of an animal is, after all, nothing more than the law of symmetry, which is a pervading feature throughout nature. That a horse or a bullock with long legs should also have a long head, is in perfect keeping with such law. A long-legged horse with a short head, or a short one with a long one would not be symmetrical, therefore abnormal. So a cat is born deaf; and with this defect in one organ of sense, is a peculiar colour in another. Mr. Darwin says this is invariable in the cat. But he does not mean to assert (because he is a man of eminence, and would not, I am sure, descend to sophistry so unworthy,) that *because* the iris of the cat is blue, *therefore* the cat is deaf! No, he merely asserts a coincidence; but I may take the liberty of remarking that this should not have been mentioned as an instance of correlation of growth. If it means anything, it

is simply that a deaf cat with blue eyes has transmitted its auditory defect and visual peculiarity to its successors. But it would be the height of absurdity, to suppose that by selecting this coincident defect, a cat-fancier could produce a correlation of other parts of structure in the cat!

Of the facts quoted from Heusinger I know nothing; but I will venture to wager my existence, that I will poison a black and white pig, or a black and white sheep, with the same doses of the same poison, whatever that may be. Hairs, teeth, horns, feathers, and skins, being all merely modifications of the same epidermic fibre, there is nothing at all wonderful in the fact, that there should be a reciprocal relation between their growth and development. But if Mr. Darwin means to assert, that by taking animals having any peculiarity of growth in the epidermic fibrous element, he can induce a modification in the growth of any other distinct element, or, if in other words, he says he can affect the normal growth of nerve, bone, blood; or that he can produce, by crossing, a correlation of growth between structures anatomically or histologically different, I tell him he asserts that which is disproved by every known fact in science.

So much for correlation. Mr. Darwin's next cause of variation is inheritance. This is the very basis of his doctrine, and singularly enough he writes himself, unconsciously, a condemnation

of his own theory! He first dismisses from his category, as not serving his purpose, all variation which is not inherited. It is important to bear this in mind, because it is an admission that the "law" of variation is largely exceptional, which, at all events, takes it at once out of the list of natural or biological laws, which are uniform and constant.

Then Mr. Darwin asserts that "like produces like," which is quite true, and sums up by stating that the "inheritance of every character is the rule, and non-inheritance is the anomaly." A sounder or truer passage was never penned. Inheritance is the great Divine law by which species have been preserved pure; *non-inheritance of a perfect form* is the source of an anomaly of variation. Such is my reading of this passage. Can it be otherwise? If answered negatively, then we must admit that no race, or species, or form of any kind was ever perfect or pure, or that the inheritance of variation is a constant law; that of purity the anomaly and exception!

Oh, but says Mr. Darwin, I mean nothing of the kind, "I do not consider the law of variation constant, but I do believe the law of inheritance constant. Take one hundred individuals, and suppose one of them exhibits a variation. This variation is inherited by the succeeding progeny, modified of course by its union with a pure individual; and the modified progeny will go on, shall I say for ever, producing beings like themselves? No, I don't say for ever; for after a

thousand generations another variety will occur, which will produce varieties like itself for another thousand generations, and so on until the variation has so far receded from the original form, that instead of being an oyster it has become a fish; after numberless generations the fish becomes a serpent—the reptile, in the course of time, changes into a bird—and then the bird into a mammal: all its adaptations for living in certain media, its mode of development, and its instincts being changed at the same time that the physical structure is changed. This is my belief."

But whence, I ask with all deference, did our mammal, which we have just formed, arise? Why, from Mr. Darwin's anomaly, out of one hundred species! What became of the ninety-nine? They, of course, were pure species! They went on developing according to a natural law which would perpetuate them for ever.

"Stop," again exclaims Mr. Darwin, "why will you continue to misrepresent me. In the course of time there would be other varieties arise. The descendants of the ninety-nine would produce other anomalies, and they would go on multiplying and increasing, and becoming altered in structure, and gaining new parts, and becoming new forms."

Very well, but what becomes now of your law of inheritance; you are ignoring the rule altogether, and throwing all the work upon the exception, or, as you call it, anomaly! And such is the conclusion to which Mr. Darwin's reasoning inevitably tends. If we take the other

side of the question, and assume that the ninety-nine were not pure forms, but those that had been subject to variation were, then the *law* becomes at once a constant, not an intermittent quantity; and no one, I presume, will contend that there is a natural law of variation acting uniformly and constantly in living organisms! Of course such a law, did it exist, would destroy all permanence and stability in species, and the various forms of life would be merely transitional, and constantly passing from—I was going to say one form to another; but this would be absolute nonsense, for without permanence and speciality there could be no typical being to classify, and the whole race of living things—plants and animals, would be merely the various expressions of the phases of the same thing.

But Mr. Darwin does not claim a general and constant law of variation. He attempts to arrive at the same conclusions to which such a law must evidently lead us, by other means. According to his theory, a variation takes place some time in the history of the creature. This variation leads step by step to altered form, structure, and habit; but he does not say this results from an inherent principle in the animal or plant *alone*. The external agencies are what he terms the "struggle for existence," giving to such a varied form a condition superior to others of its class, and therefore ultimately causing their extinction and its permanent position in the scale. In addition to this struggle he creates

another power or force, which he calls "natural selection," which is nothing more or less, in plain language, than transferring to nature the functions of the pigeon-fancier. But then he is obliged to add to the natural selection force such aids as "use and disuse," "acclimatisation," "correlation of growth," "compensation and economy of growth," and the sum total of these forces he terms "The Law of variation."

And through the medium of these laws he not only changes species, but genera, families, and classes! Converts the fish into a bird, the cold-blooded reptile into a mammal. By these means he alters not only the form, colour, and habits of the being, —its instincts, passions, reason, —but even its minute structure. He changes the huge blood disc of the siren into the small one of the goat or the dromedary, and all those intermediate, with the capacity of the capillaries through which they move! The form of the fish's eye, which is adapted to allow for the refraction of light, is only a modification of that by which the eagle sees its prey in its lofty flight; its gills, adapted to receive a supply of air in water, but an altered phase in that which breathes in the atmosphere; its egg and development a "variation" of the same organisms which have produced the uterine mammal. It is perfectly useless in such a system to look for design. Such a thing could only exist by special creation, and this Mr. Darwin ignores with a vehemency which is quite appalling.

Why talk of our god-like reason and the perfection of our senses, and their adaptation to the world around us? Mr. Darwin will tell you they are but degrees in animal development,—they are the results of his law of variation,—of his struggle for existence and natural selection,—marks only of progress in the great law of change which he says has existed in the physical world for a period too great for the mind to grasp, and from which he assumes that "no cataclysm has desolated the whole world, and that we may look with some confidence to a secure future of equally inappreciable length," in which, "judging from the past we may infer safely that not one living species will transmit its unaltered likeness to a distant futurity."—(Page 489.)

Now if the last passage is true, Mr. Darwin's law must be a constant and universal one, which we have just seen is a profoundly absurd supposition, and distinctly over and over again denied by Mr. Darwin. How strange, if there is a vestige of truth in this remarkable theory, that we should never either in past or present time have seen a transitional species. Immense time is one of the pillars of Mr. Darwin's doctrine. Variation also being gradual, the changes must occur in successive periods, and it passes all belief that neither during the historic period, or lapse of time since the Silurian epoch, the very thought of which takes away one's breath, no single solitary instance of the transmutation of

species, or the preparatory changes necessary to such alteration should have been discovered! It is impossible to conceive that if such a change took place that it would not be going on, however slowly, daily before our eyes. For, assuming the origin of species from a single form, the divergence and splitting up must have been so enormous, that it would be inconceivable that none of the lines should have fallen upon the present race of mankind, or that, like other known laws in nature, this one of variation or transmutation should not have become manifest! As an instance of the non-variability of animal life I may mention here that Agassiz, in his admirable work upon classification, states that he has convinced himself by repeated and careful examination, that the coral reefs of Florida have taken at least two hundred thousand years to form by Polyps, the descendants of which are now living unaltered, and working away as fast as ever.—(Page 80.)

The rest of Mr. Darwin's first chapter is occupied in speculations about the origin of domestic species from one or several wild ones, the latter of which opinion he holds as to dogs and fancy pigeons. He gives no opinion about sheep or goats, but thinks with Mr. Blyth that the Indian humped cattle descended from a different stock from our European cattle. Horses Mr. D. thinks descended from one wild stock. Poultry not; Mr. Blyth believes they arose from the wild Indian fowl, (*Gallus bankiva.*) Ducks

and rabbits from the common wild duck and rabbit. He finishes by a dozen pages upon "selection by man," and sums up by expressing his belief "that the conditions of life, from their action on the reproductive system, are so far of the highest importance as causing variability. "*I do not believe that variability is an inherent and necessary contingency under all circumstances, with all organic beings, as some authors have thought.* Variability is governed by many unknown laws, more especially that of correlation of growth,—the effects are modified by inheritance and reversion,—something is attributed to the direct actions of life,—something to use and disuse." And then Mr. Darwin expresses the easily-imagined result as being "thus rendered infinitely complex." Crossing, however, has had something to do with it, but "over all these causes of change I am convinced that the accumulative action of selection, whether applied methodically and more quickly, or unconsciously and more slowly but more efficiently, is by far the predominant power."—(Page 43.)

So here we have this unknown power of "natural selection" acting upon an uncertain variability, which is governed by "unknown laws," distinctly compared with that selection which is applied "methodically" by man, operating in the former case "unconsciously" but "more slowly and efficiently."

CHAPTER III.

Variation under Nature is the subject of Mr. Darwin's second chapter. He commences by stating that he reserves for his future work the numerous facts by which he can prove that species vary in a state of nature. It is in these first lines of Mr. Darwin's work that we shall find the elements of his theory. For instance, "Do species vary in a state of nature?" The answer which all naturalists will give to this question is in the affirmative; but they by no means mean this in the sense entertained by Mr. Darwin. His answer, reduced to its literal signification is; that variation means an organic change in the fabric of the organism, which has the principle within it of still further change, by successive development through great periods of time, until the animal or plant becomes transformed into an organism totally different from its original form,—a wheat plant into an oak tree, or a fish into a human being.

Now I rejoin to this, that although we have abundance of evidence of variation in species, we have not the slightest atom of proof, or even the shadow of probability, either in comparative anatomy, or the records of geology, or in anything that is known in the laws of life and development, to prove that species are

transmutable in the sense used by Mr. Darwin. On the contrary, we have evidence so strong and overwhelming on the other side of the question, that it is perfectly astonishing how any person, much less a distinguished naturalist, could have arrived at the same conclusion as he has done.

"In a word," writes an elegant American author, Dr. Brackenridge Clemens, "regeneration is a manifestation of continuous growth in species in their respective cycles of organic evolution around which the structural processes revolve, and repeat themselves, continuously and precisely what had been accomplished by pre-existing representative bodies, without power to exceed or restrict a designated and pre-ordained orbit. And for each there is a persisting life, never intermitted for an instant of time, running through a chain of representative bodies, and reaching from the first created conception, not only to the present time, but into that future when organic existence shall have terminated. This produces, and must continue to produce, successive representatives, which harmonize and agree with the original and inceptive organism, and are not only similar to it, but identical amongst themselves. The mind can detect no essential difference on which to establish distinctions, and we recognise them as the same beings, the same conception, whatever may be their geographical origin; all structural differences have disappeared, and investigation proves that each individual repeats and reiterates one and

the same biography, with all its distinctive peculiarities."—(Reprinted from the Journal of the Philadelphia Academy of Natural Science, in Stainton's Entomological Annual for 1860.

And what says Professor Owen, a man whose authority, I presume, no one will doubt:—"No species of animal has been subject to such decisive experiments, continued through so many generations, as to the influence of different degrees of exercise of the muscular system, difference in regard to food, association with man, and the concomitant stimulus to the development of intelligence, as the dog; and no domestic animal manifests so great a range of variety, in regard to general size, to the colour and character of the hair, and to the form of the head, as it is affected by different proportions of the cranium and face, and by the intermuscular cresta superadded to the cranial parieties. *Yet under the extremest mark* of variety so superinduced, the naturalist detects in the dental formula, and in the construction of the cranium, the unmistakable *generic* and *specific* characters of the *Canis familiaris*."—(On the Classification and Distribution of the Mammalia, 1859.)

What says Mr. Woollaston, who is so often quoted by Mr. Darwin, and who is undoubtedly one of our best writers on the variation of species:—"However difficult it may be in some instances to distinguish aright between species and varieties as rigidly defined, there is an instinct within us which often recognises the *latter*, even

at first sight as unmistakably such."—(On the Variation of Species, page 8.)

Again, "Whilst exploring the *barren* moor or bleak upland heights, the botanist would as assuredly look for a change in the outward configuration of certain species which colonize equally the rich meadows and teeming ravines, as a geographical difference is *a priori* anticipated between the hard sturdy mountaineer and the more enervated denizen of the plain. A daisy gathered on the cultivated lawn has usually attained a greater degree of perfection and luxuriance than its companion from the sterile heath; and the bramble which chokes up the ditches of the sheltered hedge-row, wears a very different aspect from its stunted brother of the hills."—(Op. Cit, page 9.)

One more extract from Mr. Woollaston's valuable work:—"Still less would I willingly lend a helping hand to that *most mischievous of dogmas*, that they (local influences) are *all* important in their operation,—or, in other words, that they possess within themselves the inherent power (though it may not be invariably exercised) of shaping out (provided a sufficient time be granted them, and in conjunction with the advancing requirements of the creatures themselves) those permanent organic states to which the name of species (in a true sense) is now applied. Such a doctrine is in reality nothing more than the *transmutation theory in all its unvarnished fulness*; and I do not see how it can be for a

moment maintained, so long as facts (and not reasoning only) are to be the basis of our speculations."....."It does indeed appear strange that naturalists who have combined great synthetic qualities with a profound knowledge of minutiæ and detail, should ever have upheld *so monstrous a doctrine as that of the transmutation of one species into another*—a doctrine, however, which arises almost spontaneously, if we are to assume that there exists in every race *the tendency to an unlimited progressive improvement.* There are certainly no observations on record which would in the smallest degree countenance such an hypothesis."....."It is moreover a singular phenomenon, and one in which the strongest proofs of design (or a primary adjustment of limits with a view to the future) may be discerned, that the members of the organic creation, which display the greatest adaptive power, are those which were apparently destined to become peculiarly attendant upon man."..... "The whole theory is full of inconsistencies, from beginning to end; and from whatever point we view it, it is equally unsound."—(Op. Cit, pages 186-8.)

Such were the recorded opinions of Mr. Woollaston in 1856, and to whom does the reader suppose his work is dedicated? To no one else but Mr. Darwin! Alas for human nature! Could Mr. Woollaston, when he penned the above sound and excellent remarks, have dreamt that the man to whom he dedicated his

book, should in 1860 have written a work ascribing all living things to a common progenitor, and arguing that all animals and plants are but transmuted individuals, possessing within themselves "the inherent power (variation) of shaping out (natural selection) those permanent states to which the name of species is now applied."

But the most singular circumstance connected with these sound and well-expressed opinions of Mr. Woollaston three years ago, is that Mr. Darwin not only frequently quotes facts from Mr. W.'s researches in Madeira, in support of his hypothesis, but he actually relies upon some of them as the very basis of his theory! Surely Mr. Woollaston has not become a convert to Mr. Darwin's views. If so, what value can be attached to the reasonings of scientific men, or the strong "dogmatic decision" with which they draw conclusions from facts.

I will yet quote another authority—that of one of the greatest and most profound naturalists of this or any other age, Louis Agassiz. "It was a great step in the progress of science when it was ascertained that species have fixed characters, and that they do not change in the course of time. But this fact, for which we are indebted to Cuvier, has acquired a still greater importance since it has been established that even the most extraordinary changes in the mode of existence, and in the conditions under which animals are placed, have no more influence upon their essential characters than the laps-

of time."—(Essay on Classification, page 76.)

"Between two successive geological periods then changes have taken place between animals and plants. But none of those primordial forms of life which naturalists call species, are known to have changed during any of these periods." —(Op. Cit, page 76.) "And nothing furnishes the slightest argument in favour of their (species) mutability. On the contrary *every modern investigation* has gone only to confirm the result first obtained by Cuvier, and his views that species are fixed."—(Page 78.) "There is no more reason to suppose species equally allied, following one another in time to be derived one from the other; and all that has been said in preceding paragraphs respecting the differences observed between species occurring in different geological areas, applies with the same force to species succeeding each other in the course of time. When domesticated animals and cultivated plants are mentioned as furnishing evidences of the mutability of species, the circumstance is constantly overlooked or passed over in silence, that *the first point to be established* respecting them, in order to justify any inference from them against the fixity of species, would be to shew that each of them has originated from one common stock, which, far from being the case, is *flatly contradicted by the positive knowledge we have that the varieties of several of them at least are owing to the entire amalgamation of different species.*"—(Pages 81-82.)

Talking of domesticated animals and plants he observes,—"they must be well distinguished from permanent races, which, for aught we know, may be primordial, for breeds are the result of the fostering care of man; they are the product *of the limited influence and control the human mind has over organized beings*, and not the free product of mere physical agents. They shew, therefore, that even the least important changes, which may take place during one and the same cosmic period among animals and plants, *are controlled by an intellectual power*, and do not result from the immediate action of physical causes."—(Page 82.)

"Modern science, however, can *shew in the most satisfactory manner*, that all finite beings have made *their appearance successively* and at *long intervals*, and that each kind of organized beings has existed for a definite period of time, in past ages, and that those now living are of comparatively recent origin. At the same time the order of their succession and their immutability, during such cosmic periods, shew no casual connexion with physical agents, and the known sphere of action of those agents in nature, but argue, in favour of repeated interventions on the part of the Creator."—(Page 84.)

Now these are the deliberately-expressed opinions of men who have devoted their lives to the study of these questions. No one will, I think, be bold enough to say the conclusions arrived at by such men as Owen or Agassiz

are to be treated with indifference. For the grounds upon which these opinions are formed, I must refer to the several works upon comparative anatomy and zoology which they have written.

Mr. Darwin next attempts to give a definition of "a species." This is one eminently calculated to fall in with his theory. "A species," says Mr. Darwin "includes the unknown element of a distinct act of creation," and as he intends to prove that all living things have arisen from one form; and as he particularly and most strongly combats the idea of the varieties of animals and plants being the result of *special* acts of creation, it is clear that in his opinion there never could have been but one species, and that was the original "unknown element of a distinct act of creation."

I will here again quote the elegant remarks of Dr. Clemens, (Op. Cit,) as I think it would be impossible to define correct notions about "species" better; and I shall, in criticising Mr. Darwin's views, always prefer to answer them in the words of men of much higher authority than myself:—

"In endeavouring to form a conception of what constitutes *species*, our ideas must be separated from the *individual*, which is merely the representative of species in some one of its special states or conditions. Every mature or perfected being has had an anterior organic history included in the history of its structural progression, from a collection of simple cells to a natural body,

possessing individual and distinctive characteristics. No one of its states or conditions constitutes species; neither the perfect insect nor the pupa, nor the larva, nor the ovum, fulfil in themselves the conception involved in this term, but simply represent the various relations the individual maintains to physical and animated nature, and during the continuance of which its structural and peculiar biography is written.

The perfect being is the temporary expression of a thought, or conception involved in the series of actions which constitute in their entity a *special and definite creation*, and in this state has reached the acme of its perfectibility, a point beyond which it cannot pass; but after a variable period its organic part is broken up, and resolved again into the simple or primary elements of matter. The species, or the thought however does not cease to exist during the process of organic disintegration of the individual, and previously to its disappearance or death, it represents its special organism, or rather its *species*, by means of an ovum, in which the organic actions destroyed in the previous representative, are recommenced, and again carried through a series of changes or states to the point of its previous organic perfection; commencing in the simplest organic state, and continually returning to renew a *series of predetermined special developments*. We have in species a cycle of persistent ceaseless actions, revolving in their narrow orbit, *with all the indications of design*, and with comparatively as much

invariability as the great planets observe in their appointed paths."

And to continue the chain of this beautiful reasoning, let us hear what the same writer says of a variety as distinct from species.—

"For wherein does a variety differ from species? Is it by any difference in the ovum, any peculiarity in the form, structure, ornamentation, or biography of the embryo, any difference in pupation, or any essential or specific variation in the structure of the perfect insect? By no means. To be a variety or wandering from a certain specific type, it must observe the same biographical and organic cycle, possess the same specific characteristics of structure in its perfect state, but differ from the species in its peculiarities of ornamentation, and in its size perhaps, to a degree that without a knowledge of its embryology and biography it would be pronounced and registered distinct from the perfect individuals, towards which it shews the strongest specific affinities of structure.

Variation or specific instability observes fixed and determined limits, which must be ascertained by observation in part of the true history of species. It is not manifested to the same degree, probably in the specific character of every true species, but wheresoever and whensoever it does occur is capable of being referred to its normal type by its agreement in all those essential characteristics necessary to form a conception of a true species. As long as the diagnosis must

be confined to a description of the ornamentation of the perfect being, *there are no means of distinguishing certainly the variety from species*, should the former differ from the latter essentially in this respect; and I have no doubt that every effort at systematization with a knowledge of perfect forms alone, contains many illustrations of the attendant difficulties of discrimination."

Mr. Woollaston considers species "to involve that ideal relationship amongst all its members, which the descent from a common parent can alone convey;" while varieties, he thinks, "should be restricted, unless I am mistaken, to those various aberrations from their peculiar type, which are sufficiently constant and isolated in their general character, *to appear* to be at first sight distinct from it."—(Op. Cit. page 4.)

With the above opinions Mr. Woollaston "assumes" as true, that there have been "specific centres of creation;" a doctrine which is supported by evidence of the highest kind, brought forward by the late lamented Edward Forbes.

"Any two races of animals," says Dr. Carpenter, "are considered to be of *distinct species*, which are marked by characters of difference that are constantly exhibited; so that neither shews any tendency to lose its own peculiarity, or to acquire that of the other. Thus, notwithstanding the variety of form exhibited by the several races of dog, we never see any which present so strong a resemblance to a fox as to be at all in danger of being mistaken for that animal;

and they may always be distinguished by this obvious character—that the *pupil* of the eye of the dog is always round, whilst that of the fox is oval when contracted."—(Animal Physiology, § 533.)

Mr. Darwin alludes to "monsters," and to the number of cases he could adduce, in which parts of importance, physiologically, vary in individuals of the same species. But what are these cases in comparison to the vast bulk of normal forms? And again, are not these deviations in almost every case degradations from the natural standard of structure? And are they not frequently produced by an altered or an unnatural mode of life? You take the larva of a caterpillar from its tree out of doors, and you feed it in confinement, and then are astonished to find some deviation from its normal character.

It appears to me that the introduction of these accidental or induced abnormities of form, as an illustration of even a tendency towards the transmutation of species, is feeble in the extreme. The proof we want, is not that structure will vary, or that even induced peculiarities are inherited, but that such change or inheritance is a natural law by which one species is ultimately changed into another. I repeat, that in Mr. Darwin's book we have not the shadow of a proof of this.

"But," said an intelligent man to me in the course of conversation, "you do not mean to say that Mr. Darwin argues that a zoophyte is the

veloped into an oyster, the oyster into a crab, the crab into a fish, the fish into a reptile, the reptile into a bird, and the bird into a mammal? I look upon his views in a different light. I regard his theory to mean that starting from any one point his forms, are an infinity of divergences ultimately terminated in species as we see them; the lives being long or short according to the position of the organisms in the scale, and that he does not inculcate the necessity of passing through the phases you have just quoted."

To the naturalist of course I need not reply to this observation. If Mr. Darwin's theory means anything, it means *progressive development*. He expressly states that each stage of variation must be for the benefit of the individual, which benefit in the "struggle for existence" he turns to his own account. But if Mr. Darwin does not mean that his species have passed through the phases of existence as exemplified by modern classifiers, his theory becomes infinitely more improbable, because the difference between intermediate forms must have been much greater, and the chances of their being formed by "natural selection" still greater also. Thus, what corresponds to the heart of higher animals, in the insect is a mere dilated tube; this in the fish is differentiated into a heart with an auricle and ventricle; in the reptile there are three cavities, in the bird and mammal four. Now as each of these hearts are peculiarly adapted to the condition of life of the individual species, Mr.

Darwin's variations must have either taken this course, or he must have disproved the maxim he is so anxious to support. "Natura non facit saltum."

But Mr. Darwin is himself very explicit upon the subject. "If it could be demonstrated that any complex organ existed which could not possibly have been formed by *numerous successive slight modifications*, my theory would absolutely break down."—(Page 189, Chapter VI.)

But then seeing the difficulty, he argues it thus,—"If we look to an organ *common* to all the members of a large class, in this case the organ must have been first formed at an *extremely remote period*, since which all the members of the class have been developed; and in order to discover the early transitional grades through which the organ has passed, we should have to look to very ancient ancestral forms, long since extinct."—(Pages 189–90.)

And then he goes at once into what he calls the proof of transition in organs, by adducing the homology of the swim bladder in fishes and lung of mammal; and because some fishes aerate part of the blood in the swim bladder as well as the lung, Mr. D. considers he has adduced an instance of how the minor organism may be transmuted into the major, or, in his own words, "there seems to me to be no great difficulty in believing that natural selection has actually converted the swim bladder into a lung, or organ used exclusively for respiration."—(Page 191.)

And in the next passage:—"I can hardly indeed doubt that *all* vertebrate animals having true lungs, [at the head of which is man,] have descended by ordinary generation from an ancient prototype, of which we know nothing, furnished with a floating apparatus, or swim bladder." An organ now at all events exclusively confined to fishes, animals living in water.

But to prevent any doubt of Mr. Darwin's views on this subject, I will quote one more passage. Alluding to the doctrine "Natura non facit saltum," he remarks:—"Why on the theory of creation should this be so? Why should all the parts and organs of many independent beings, each supposed to have been separately created for its proper place in nature, be so invariably *linked together* by graduated steps? Why should not nature have taken a leap from structure to structure? On the theory of natural selection we can clearly understand why she should not, for natural selection can act only by taking advantage of slight successive variation; *she can never take a leap, but must advance by the shortest and slowest steps.*"

The ground, then, is cleared of all doubt as to Mr. Darwin's meaning. The fish has been converted into the lung-breathing animal. But we have lost the prototype, says Mr. Darwin. How is this? He argues from an existing type, that certain changes have taken place between the swim bladder and the lung, ending in the conversion of the one into the other. But why

does he reject the existing form, from which his inference is drawn? Why first infer the wildest improbability, and then extend the range of his speculation into the dark unknown, unfathomable myth of a pre-silurian world.

Are we prepared to give up all our cherished notions, and belief in the adaptation of structure to the circumstances of existence. Our appreciation of design, as the mark which the Creator has imprinted on the created,—to a wild speculation without even the support of the ordinary basis upon which reason argues out its facts?

We see a race of human beings living in every part of the known world, gifted with the highest mental faculties, and endowed with the loftiest notions of religion. We see animals of unnumbered forms roaming through the wild and uncivilized tracts of the world. The sea has its myriads, adapted to a special existence. The birds of the air, in varied plumage

"Bear on their wings and in their notes His praise."

Descending lower in the scale of creation, we see numberless forms of exquisite structure, all in their appointed sphere. Go where we will we find life, but always adapted to a special end, and formed for a wise purpose. All this we combine into a great scheme of creation, ordained and perfected by Infinite Wisdom. Adopt Mr. Darwin's theory, and what do we see? Through the gloom of myriads of ages

we behold an "unknown element of special creation," uniting in itself the male and female structure. This primordial form has by its liability to vary in its progeny, become the parent of every plant and animal in the world! We are not told how long it remained sole tenant of the mighty world—how long the air and the deep waited for their creatures. We are led to suppose that some time after it was called into existence some one of its descendants exhibited—by mere chance, not by natural law, for we have seen a natural law cannot be partial in its operation,—some slight variation. This alteration was transmitted to its offspring, and again it varied.

As it can be pretty clearly proved that man has not varied towards a different form, at least during the historic period, it is clear these variations, slight as they were, must each have taken thousands or even millions of years to form. Never mind; land, air, and water are patient; they still wait for their living tenants. At length our organism arrives at a point in which a great "struggle for existence" takes place; one class of descendants shews a decided tendency to "vary" into plants, another has an animal tendency. The animal being the strongest wins the day, and henceforth takes the lead, and we have perfected the first animal form! Happy in its defeat, the unconscious plant takes root in the earth, and we have the first vegetable structure. Of course these forms must be her-

maphrodite. For countless ages they each go on increasing. Natural law plays her part well at first, and predominates; at length each form varies. The variation becomes permanent, and is transmitted from race to race. Gradually one variation takes one form, another assumes a different one. The "struggle for existence" in a world designed to be peopled, goes on. Myriads of ages pass. Continents are destroyed and buried beneath the deep, carrying with them every transitional form by which posterity could recognise the power of "natural selection." The dawn of that geological epoch, which we now call the first that came into existence, is attained. But all that has been arrived at by the "laws of variation" are structures similar to those of our coral or sea-weed, oyster, nautilus, or woodlouse. These, then, must have been the progenitors of the present race of man, and every animal on the face of the earth!

And now we come to a period in the world's history, according to the Darwinian theory, which can be measured by our knowledge. For hundreds of thousands of millions of years since the silurian epoch there are geological evidences of the life that has been in the world. And what do we see? In that vast period of time we never discern a form which is transitional from one kind of animal or plant to another *of a different class!* But these forms must have been at work; a variation occurring here produces a fish, there a lobster; now we see a

reptile changed into a bird, because some fortuitous variation gave it the mastery in the struggle for existence. But look further on, credulous mortal, the oviparous bird has to be changed,—into what? Why, into the mammal, with its uterine gestation, and its human form at the top of the list. One now feels a strange interest in the matter,—birds, reptiles, fish, lobsters, insects, worms, zoophytes, protozoons, plants, all shade into insignificance before the phase in the scene now opening out. The bird has at length been converted into the duck-billed platypus, or the porcupine ant-eater! Hail, profound progenitor of mankind; henceforth you must take your proper rank among the very highest of the mammal race, for your blood is our blood, and your bone our bone.

But unnumbered ages have passed away, for all links of the next stage are lost; the "possum up a gum-tree," the "bandicoot rats," the "flying phalangers," the kangaroo, and wombat next appear on the stage of existence. All these being what are termed "non-placental" or "ovo-viviparous," are the lowest group of mammals,—the line along which the "laws of variation," "natural selection," "divergence of form," etc., must have acted. We then make a great leap to the viviparous mammal—the "dugong," the "dolphin," and the "whale," all of which, because it has suited the Almighty to adapt the mode of propagation to the circumstances under which they live, naturalists have placed higher in the

scale than the agile and graceful kangaroo! Surely natural selection must here have made a grand blunder. If this is so, how much greater is the bungle in the next leap. We have to jump from the whale to the pig, thence to the tapir, the hippopotamus, the rhinoceros, the elephant. One certainly feels rather comforted as the subject grows warmer, to find swine so low down in the scale. We next jump to the horse, zebra, quagga, and ass. And here again we are thankful that a very vast number of ages must have passed since humanity was represented by a jackass. Then come the ruminants, camel, stag, the giraffe, the graceful antelope, the sheep, the goat, the buffalo, the bison, and the ox.

Now we rise wonderfully in the scale. We actually get a variation from the ox into the sloth! the armadilla! the ant-eater! But we will get on. What next?—Hares and rabbits for ever! Happy should we have been had the Darwinian theory stopped here, for then neither a dog to worry us or a man to shoot us could have been developed by "natural selection." The world would have been one, it is true, of porcupines and moles, of beavers, rats, and mice, and squirrels. Development now makes a great leap. It actually jumps from the squirrel to the walrus and seal, for both of these are considered by naturalists to be more highly organized than any I have mentioned. With what affliction Mr. Darwin's disciples must look upon Sir Leopold

Clintock's happy family party!

On we go. "Natural selection" is in full swing. Cats, and leopards, and tigers, and lynxes, were our next phases; wolves, and doggies, and hyænas our next. We then rose up to the rank of weasel, and rested for a time as bears, badgers, racoons, and gluttons!

But the subject now warms upon us, hedgehogs, and shrews, and moles form the next group in the upward road of development, and at length we rested proudly triumphant at the last stage but two. We now became vampires and bats!

Progress for ever! the way from the bat to the lemur is very short, and Mr. Darwin has shewn us how it is to be done. The "Aye, Aye" takes us from the true lemurs to the dear marmozet, thence to the American monkey, and now we reach our penultimate phase, we become baboons —monkeys proper, and ultimately anthropoid apes!

And here let us take breath for a moment. I have in the above sketch passed through the fourteen orders into which naturalists have divided the class *Mammalia*, and each animal has been mentioned according to the position *which it holds in the scale from structure*. I am not myself responsible for this classification. I only say it is one which is held by the best comparative anatomists of the present day, and being formed according to organization, it is the order in which the group must have been developed, if the progressive development theory be true.

Owen has founded a classification of the mam-

malia upon a different basis to that of Cuvier, De Blainville, and others, which I have followed. Founding his classification upon the development of the brain, the animals will rise in the scale as follows, and the reader may adopt this with perhaps greater exactitude than the other:—The "duck mole" is at the bottom, we then go to echidna, opossum, phalanger, kangaroo, wombat, rat, hare, shrew, hedgehog, mole, bat, roussette, (fruit-eating bat,) ant-eater, armadillo, sloth, whale, porpoise, dugong, sea-cow, elephant, tapir, horse, sheep, hog, seal, bear, dog, lemur, marmozet, ape,—man.

Mr. Darwin says natural selection only acts by giving to the animal some improvement by which it can benefit itself in the "struggle for existence." but "*Natura non facit saltum.*" If the opinion of naturalists is right as to the position the animals I have mentioned hold in the scale, then it clearly must indicate the line through which Mr. Darwin's principle has worked, and as he distinctly says that he believes, (though he infers more,) that each class has been formed from one prototype, then he must believe that the class Vertebrata, including the four sub-classes fishes, reptiles, birds, and mammals, have been derived from one form, and the line must, according to the argument I have brought forward, and Mr. D.'s own doctrine of "*Natura non facit saltum*," have passed, though with many millions of lost links, through the series of typical mammals I have mentioned.

Well, having arrived at the anthropoid ape, the Gorilla for instance, the passage is inevitable. There is no mincing the matter,—the next step is that of man himself.

But where, I ask, and one feels now growing serious, where, I ask Mr. Darwin, are your intermediate forms? I tell you in the face of the whole world of men who call themselves scientific, that the deduction is the wildest, most absurd and visionary, and unwarranted assumption. Take, if you will, the degraded Bushman and the highest ape, and I say that although so similar in many parts of form, the difference is *immense* in anatomical structure; and if this is so between man and the ape, *a fortiori* it is so between man and every other affinity in the living world. And is this the result of the study of natural science in the nineteenth century? This the result of your forced analogies and homologies! Better ten thousand times that Science, with every Professor it ever had, were at the bottom of the sea, than that it should have culminated in such absurdity.

But Science is still and *will* be vindicated. There is One by whom the whole world was created,—"male and female created He them,"—and there are hundreds and thousands of men learned in science who will raise their voices against a doctrine which, originating in the wildest improbability, is supported by no proof, and leads inevitably, whichever way you tread, to the most ridiculous and absurd conclusions. No! there is

a God who made the world in which we live, and adapted every living thing in that *scheme of creation* to the circumstances under which it exists. Every animal is formed by intelligent thought for its position, and specially organized for the mode in which He willed it to live. The whole scheme is one of exquisite beauty, formed upon a unity of plan and of design, which, though we may not comprehend it, always gives a thrill of delight to the true student of Nature. It is admitted even by the coldest and least imaginative bookworm that ever toiled through a blank and hopeless existence, that this unity of type and design does unconsciously raise the mind from "Nature up to Nature's God."

This feeling is one innate in the human mind, and who shall dare to say that it is not one of the means by which He chooses to reveal His Omnipotence and Power. I have and shall avoid the many arguments which the Bible might afford me in this inquiry. I fully admit that there may be forced interpretations of the Pentateuch. But I will leave others to use these weapons if they choose. I repudiate Mr. Darwin's theory, but I will draw my arguments from Science and Natural Religion alone, and this simply because Mr. Darwin has very properly, and very prudently for himself, avoided opening the wider issue.

CHAPTER IV.

The third chapter in Mr. Darwin's book is occupied by the consideration of "Struggle for Existence," with its bearing upon "natural selection, which is dealt with in the fourth.

By the "struggle for existence," Mr. Darwin considers that "any variation, however slight, and from whatever cause proceeding, if it be in any way profitable to an individual of any species in its infinitely complex relations to other organic beings, and to external nature, will tend to the preservation of that individual, and will generally be inherited by its offspring."

There can be no doubt about the "struggle for existence." From man to the lowest animal the product of life is necessary to support life. It is a part of the great and inscrutable scheme of nature that it should be so. A vast number of animals subsist upon each other, while the rest live upon plants, and we see a beautiful gradation in the mode of preparing food for the higher animals. Every thing necessary for man's existence is taken out of the earth and air by the family of grasses, but he would die if fed upon grass alone. Therefore it is necessary there should be intermediate forms, and the ox and the sheep convert the grass into beef and mutton, which is the principal part of human food. Is

this design as exemplified by special creation, or is it the result of an unknown and inexplicable law of variation?

But Mr. Darwin argues that this "struggle for existence" is one of the chief means by which the weakest goes to the wall, and the varied species having by good luck obtained the development of some organ it had not before, gains the day—only in its turn to be driven out of the field by some more fortunate subject of "natural selection!"

But is this so? Let us look for a moment, say, into a drop of water. Perhaps the first thing I shall see there through the microscope is a shapeless unsymmetrical mass, of a fleshy substance, having life without members to, or orifices in its body. I see it feed.—Another (more highly organized) form comes in contact with this lump of flesh, and is instantly fixed there by the vital instincts of the creature. Well, I look on with wonder, and I see this animal called the Ameba enclose its victim within its flesh; there is no opening, but yet the animalcule is dining! Gradually the prey passes through the textures of the ameba's body into its cavity, and the opening closes up. When thoroughly digested, the remains are seen to be transmitted outwards again in the same way!

Now we can hardly conceive an animal form more simple in its organization than this. Whence, according to Mr. Darwin's doctrine, did it come? Is it the result of one of his lines of divergence,

passing through all time, and yet escaping through all the "struggles for existence," and now in this advanced age of creation, shewing no modification of form—no improvement by "natural selection?" And mark, this is one of a class of creatures, (the Protozoa,) of which a few teaspoonsful of water would yield more in number than all the other animals in the world! Nay, their remains actually form the entire structure of some of our thickest geological formations, as the chalk, and yet we are calmly to believe that there has been a "struggle for existence" going on from all time, by which the stronger *must* obtain the mastery over the weaker! But the ameba and the sponge, the rhizopod and the infusorial animalculæ still exist, and will for ever prove the permanence and stability of species. These creatures all live upon each other, but the lowest and the highest forms, with their intermediate grades, still retain their unaltered individuality.

Mr. Darwin says, and truly, that the rate of increase of animal life is so great, even in the slowest-breeding animals, that if there was not a "struggle for existence," a triumph of the strong over the weak, there would, in a few thousands of years, be no room for them upon the earth, in fact that the carnivora have already reached their maximum.

"Even slow-breeding man has doubled in twenty-five years, and at this rate, in a few thousand years, there would literally not be standing room for his progeny."—(Page 64.) How does Mr.

Darwin reconcile this statement with his opinion given towards the end of the book. That "as all living forms of life are lineal descendants of those which lived long before the silurian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that no cataclysm has desolated the whole world. *Hence we may look with some confidence to a secure future of equally inappreciable length.*"—(Page 489.)

Now, according to Mr. Darwin, the reason why, in a few thousand years, the world will be able to hold and support its human inhabitants, must be that the "struggle for existence," and "natural selection" will have so altered the ever-varying animal form, that it will have "progressed further towards perfection."—(Page 489.) If the world will not hold us in a few thousand years, and yet we are to look forward to an earthly future as long as Mr. Darwin's pre-silurian world, and the geological and historic period, I see no other way of getting out of the dilemma but by interpreting Mr. Darwin's theory as above. But Dr. Darwin has himself told us there will be this change. "Judging from the past, we may safely *infer that not one living species will transmit its unaltered likeness to a distant futurity.* And of the species now living, very few will transmit progeny of any kind to a far distant futurity."

Now, if we look at page 18, we shall read, "But Mr. Horner's researches have rendered it

in some degree probable that man, sufficiently civilized to have manufactured pottery, existed in the Valley of the Nile thirteen or fourteen thousand years ago; and who will pretend to say how long before these ancient periods, savages, *like those of Tierra del Fuego or Australia*, who possess a semi-domestic dog, may not have existed in Egypt?"

Now seriously let us compare these phases of Mr. Darwin's argument. If savages, similar to those of Tierra del Fuego or Australia, which are known to be human now, existed for an indefinite period before fourteen thousand years, how can Mr. Darwin assume, with the slightest reason or plausibility, that in a "few thousand years" the human form will have become altered, while still living on the earth? How, in fact, does he reconcile the assumed antiquity of the *human* race with his theory of the increase of population being checked by the altered form, on its road to perfection destroying the less perfectly-organized being? There is some consolation, however, for us who may have descendants in such a struggle, in the full belief we are told to entertain, "that the war of nature is not incessant, that no fear is felt, that death is generally prompt, and that the vigorous, the healthy, and the happy survive and multiply." —(Page 79.)

But with all due deference to these merciful considerations, I should strongly advise the human race to look out sharply for the first

evidence of change which must inevitably come over their bodily form!

Natural selection is the subject treated of by Mr. Darwin in Chapter IV. By this he means the preservation, by nature, of favourable, and the rejection of injurious variations.

Does such a thing exist? I firmly believe not. Mr. Darwin begs the question thus:—"Can it then be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life, should sometimes occur in the course of thousands of generations?"

Mr. Darwin illustrates the idea of natural selection in many ways. He supposes a country passing through a change of climate, and the inhabitants immediately undergoing a change; some would immigrate, and thus distort the relations of the rest. Thus "natural selection" would have a better chance of "profitable variation to work upon," and unless they are profitable, natural selection can do nothing. This "natural selection" is all-powerful. "It can act on every internal organ, on every shade of constitutional difference, on the whole machinery of life."—(Page 83.)

Instances of natural selection in the preservation of the being are exemplified by "leaf-eating insects being green," and "bark-feeders mottled grey," "the alpine ptarmigan being white in winter," "the red grouse colour of heath, and

the black grouse of peaty earth." These act as preservatives; they are exemplifications of "natural selection." I pass over the fact that "smooth-skinned fruits suffer more from beetles than downy ones; and that purple plums are less liable to disease than yellow ones," in order that I may mention a modification of the utmost importance to Mr. Darwin's theory, produced by natural selection, namely,—that "variations which under domestication appear at any particular period of life, tend to re-appear in the offspring at the same period."

Mr. Darwin hereafter founds some serious arguments on this assumed power of natural selection. It will also "modify the structure of the young in relation to the parent, and of the parent in relation to the young," but it cannot "modify the structure of one species, without giving it any advantage for the good of another species."—(Pages 86–7.)

Further, "a structure used only once in an animal's life, if of high importance to it, might be modified to any extent by natural selection, as the great jaws of certain insects, used only for opening the cocoon, or the hard tip to the beak of nestling birds, used for breaking the egg. Thus, if nature wanted to make (for the bird's own advantage) the beak of a full-grown pigeon very short, the process of modification would be very slow, and there would be simultaneously the most rigorous 'selection' of the young birds within the egg which had the

hardest beaks, for all with weak beaks would inevitably perish; or more delicate and more easily-broken shells might be selected, the thickness of the shell being known to vary like every other structure."—(Page 87.)

On what Mr. Darwin calls "sexual selection," in which he describes the various fights for mastery in gaining the lady-loves of animals and birds, I will only make one extract, which criticises itself:—"If a man can in a short time give elegant carriage and beauty to his bantams, according to his standard of beauty, I can see no good reason to doubt that female birds, by selecting during thousands of generations the most melodious or beautiful males, according to their standard of beauty, might produce a marked effect!"

To illustrate these views of natural selection Mr. Darwin gives several imaginary cases. 1.—If certain wolves and deer inhabited the same country, and *the country were to alter*, so that the deer increased in number, and the other animals upon which the wolves preyed by craft or strength, diminished; then Mr. D. can see no reason to doubt that the swiftest wolves would have the best chance of surviving, and so be preserved or selected. Or, 2.—A cub wolf might be born with an innate tendency to pursue certain kinds of prey, just as 3.—Some of Mr. St. John's cats caught mice, others rats, one winged game, another hares and rabbits; while a third used to hunt the marshes and

catch snipes. 4.—Certain plants excrete a nectar which is greedily sought after by insects. Therefore these insects would carry away the pollen to other flowers, which would transmit to their seedlings the nectar-secreting power; and those individuals which excreted most nectar, would, in the long run, gain the upper hand. If the plant were, under some new conditions, to lose one of its organs, more or less important, then the insect would carry away the tendency to transmit flowers with only a pistil or a style, and so produce diœcious plants. 5. —Some of the nectar-feeding insects, as the wild bee is known to do, might bore holes into the bases of the flowers, to get the juice by a shorter road than inserting their tongues; and "I see no reason to doubt that an *accidental deviation* in the size and form of the body, or in the curvature and length of the proboscis, etc., far too slight to be appreciated by us, might profit a bee or other insect, so that an individual so characterized would be able to obtain its food more quickly, and so have a better chance of living, and leaving descendants!" —(Page 94.) 6.—The tubes of the corolla of the common red and incarnate clover differ in length, so that the hive bee can only get nectar out of the incarnate clover, not out of the red, which is visited by the humble bee alone. Thus it might be of advantage to the hive bee to have a longer tongue; or if the humble bee were to grow scarce, it might be

necessary for the red clover to have a shorter corolla, so that the pollen might be conveyed for the purposes of fertilization from flower to flower, and this would be done by "natural selection."

And, "as modern geology has almost banished such views as the excavation of a great valley by a single diluvial wave, so will natural selection, if it be a true principle, banish the belief of the continued creation of new organic beings, or of any great and sudden modification in their structure."—(Page 96.)

Now, I think the reader will have no difficulty in clearly understanding what Mr. Darwin means by "natural selection." From the above extracts it is quite unmistakable that he means, by variation, an accidental variation in structure. My previous arguments must, I think, have proved this indirectly. We now have it in his own words. If this accidental variation is of importance to the animal, then, by mere "brute force" it obtains the mastery over other species not born with this abnormity, and transmits its superiority to its descendants. The change is assumed to have been going on for "thousands of generations," until "natural selection" separates it from its brethren, and in due course of time produces a new species,—genus,—family,—order,—class.

It is impossible to conceive anything more vague or improbable than all this. What a bungle it makes of creation. A fortunate beetle grows in

colour more like the wall on which it crawls, or the leaf on which it feeds, and this by pure accident, and it is consequently not eaten up by birds, (while its brethren are, and perish,) but lives and propagates its species, which hereafter, having a better chance in the "struggle for existence," become the dominant members of a new genus or order! Thus an exquisite piece of design, expressive as it is of the forethought of the Creator, is made to be the mere result of chance and good luck. Now the whole subject of the colour of animals is one of extreme interest, both to the naturalist and the physiologist. In many instances it is produced, as in the wing of the humming bird, by striæ or lines on the ultimate plume or barb of the feathers, which decompose the light, and produce the beautiful colouring we see in that bird. In others the colour is owing to the deposit of a pigment, having the faculty of absorbing different rays, or a mixture of rays. In others both of these causes come into operation.

If we look at the similarity of colour in animals to the various things among which they live, the knowledge of the above facts will have a peculiar significance. When we know that the same physical cause produces the colour of the desert or the wood, as of the animals that live and feed upon this organic matter so coloured, it is a just inference that the cause of the colour in both instances, that is, of the bird and the food upon which it lives, is the same. In the rasorial bird

the colour of the plumage is owing both to pigment and organic sculpturing. Thus, as Mr. Tristram has remarked, the quail or the grouse of the desert have a desert colour. The humming bird's colour, on the other hand, is entirely produced by sculpture on the feathers, and it feeds chiefly upon the nectar of flowers, which, we may fairly assume, contains no colour pigment.

Are we then to say that the exquisite and brilliant and harmonious plumage of the humming bird is due to a mere accidental variation? or that the protecting colour of the beetle or the grouse, which are partly due to organic structure, as in the humming bird, and partly to the organic functions of digestion and assimilation, and the deposit of pigment so formed? am I to be told, or am I requested to answer the absurdity, that this beautiful evidence of design, in the special creation of the animal, is due to accident? The answer to this query is found in No. 5 of Mr. Darwin's illustrations of "natural selection." We are there distinctly told that an "accidental deviation in the size and form of the body, or in the curvature and length of the proboscis, etc.," might ultimately produce by descent an important alteration in the organic structure of the animal, and he adds to this, the bungling error of supposing the change to take place in the hive-bee, by which it might reach the nectar in the long tube of the corolla of the red clover, though unfortunately for the illustration, the worker hive-bee is barren, and does not propagate its kind at all!

And let us look for a moment at the other illustrations.—

Imagine that certain wolves lived in a country with certain deer and other small fry, on which they fed. That a certain alteration took place in the climate for a year or so, which destroyed the small game, but left the deer; and Mr. Darwin thinks it quite possible that all but the swift wolves in consequence perished, because they only could catch the deer. Hence their descendants were altered or varied by being a swifter race than the former wolf. What he gains by the sum of all these suppositions I am at a loss to imagine. He only gets a swifter wolf, which he very well knows, is as likely to have a slow as a swift progeny. It does not help his transmutation theory at all, for unfortunately the animals among the carnivora, more highly organized than the wolf, are the hyænas, lions, tigers, cats, etc. The illustration therefore is unfortunate.

With regard to the innate tendency of the cub-wolf to pursue certain kinds of prey—being born, in fact, with a peculiar tendency to "deer stealing"—this mere supposition, if it were even proved by the illustration taken from *domesticated* animals, *to wit*, Mr. St. John's cats, would after all only prove the fact that one wolf could run faster than another.

With regard to the fourth illustration, the alteration of the sexual condition of plants by bees, as an instance of natural selection, it is like

the others, really worse than useless. For to give even a shade of probability to such a speculation, Mr. Darwin must prove that all diœceous plants produce nectar, or are sought after by insects; for, though I admit the frequency of this means of fertilizing plants, I object most strongly to the dogma of its being the chief or only means. Look also at the difference between these plants; what botanist would venture to say that the black poplar and the dog's mercury were descended from monœcious plants, the result of inoculation by insects?

I confess that when we look back to the writings of heathen authors, upwards of two thousand years ago, we must feel something akin to shame, that in these enlightened days, we find any scientific men arguing for the possibility of chance having anything whatever to do with the adaptive structure of organized beings.

"But that the beauty of the world might be eternal," says Cicero, in his "Natura Deorum," "great care has been taken by the providence of the Gods to perpetuate the different kinds of animals and vegetables. * * With regard to animals, do we not see with what judgment they were made for the propagation of their species? Nature for this end created some males and some females." * * "Many things must be omitted on a subject so copious; for it is impossible to relate the great utility of rivers, the flux and reflux of the sea, the mountains clothed with grass and trees, the salt pits reple-

from the sea coasts, the earth replete with salutary medicine, or, in short, the innumerable designs of nature necessary for sustenance, and the enjoyment of life. We must not forget the vicissitudes of day and night, ordained for the health of animated beings, giving them a time to labour and a time to rest. Thus, if we every way examine the universe, it is apparent from the greatest reason, that the whole is admirably governed by Divine Providence (*mente consilioque divino*) for the safety and preservation of all beings. And for whom," he continues, "was this mighty fabric raised? For trees and vegetables?—that would be absurd. For beasts? Nothing can be less probable than that the Gods should have taken such pains for beings void of speech and understanding. For whom then?—Undoubtedly for reasonable beings; these are the Gods and men, who are certainly the most perfect of all beings."

Now, I do not for a moment believe that Mr. Darwin would find fault with these noble sentiments, written by one of the greatest of classic writers before the advent of Christianity; and yet to what different conclusions do his accidental variation and inexplicable theories lead? Once admit that *chance* altered the organic structure of any permanent inhabitant of the world, and the whole superstructure of design crumbles into dust.

The author of the "Vestiges" believed in spontaneous generation. Apply this belief to the

formation of Mr. Darwin's original organism, and the whole face of living nature may be swept away from the evidences of religion, and we should have to fall back upon the "countless spheres," where, fortunately, "natural selection" can never reach.

CHAPTER V.

The intercrossing of individuals is the next subject treated of by Mr. Darwin; and it gives him an opportunity of enunciating a most extraordinary and uncomfortable doctrine, namely, that he believes "that it is a general law of nature, (utterly ignorant though he be of the meaning of the law,) that no organic being self-fertilizes itself for an eternity of generations; but that a cross with another individual is occasionally (perhaps at very long intervals) indispensible."

As this theory is supported in the present volume by the weakest possible evidence, and as Mr. Darwin confesses there are difficulties which he is still endeavouring to solve, I will pass it over with the simple expression, that I believe it to be among the most improbable speculations contained in the book. The circumstances favourable to natural selection Mr. Darwin considers are,—1.—Large amount of inheritable and diversified variability. 2.—Large number of individuals. 3.—Large areas of action. 4.—Intercrossing. 5.—Isolation.

Extinction Mr. Darwin considers to be intimately connected with "natural selection;" because, as this latter has to benefit the being, the less

favoured forms must become extinct. To illustrate his meaning upon this subject, Mr. Darwin tells us to take a "carnivorous quadruped, of which the number that can be supported in any country has long ago arrived at its full average." Then he argues that only the descendants of this carnivor *which vary* can live, (and this by assuming new habits,) some being enabled to live on a change of prey, some inhabiting new stations, climbing trees, frequenting water, and some becoming perhaps less carnivorous.

Perhaps the domains of science cannot afford a more purely gratuitous assumption than this, and one at the same time totally opposed to Mr. Darwin's own theory, that transmutation only takes place by very slow changes, acting through myriads of years. But, supposing the ground occupied by the original race of carnivora, whose average amount was made up, what became of these descendants during the process of modification? One has to have its organization altered for climbing trees; but if it has to wait for myriads of years before it can effect this, how does it exist and multiply? Another has to get its living in water, in fact, to be degraded in organization; but what became of it during the immensity of time it was being metamorphosed? Fancy a fox and descendants gazing at some fish in the water for a hundred millions of years, until it pleased natural selection to convert it into an otter! And yet Mr. Darwin's theory does violence of this kind to

reason and common sense, in almost every page!

But does the less favoured form become extinct? Mr. Darwin says it does. Geology and Professor Owen say it does not. "There are characters in land animals rendering them more obnoxious to extirpating influences, which may explain why so many of the *larger species* of particular groups have become extinct, while smaller species, of equal antiquity, have survived. In proportion to its bulk is the difficulty of the contest which the animal has to maintain against surrounding agencies.....In a dry season the large animal will suffer more than the small one, both from drought and insufficiency of food; if new enemies appear the small ones will conceal themselves, and escape. Small quadrupeds, moreover, are more prolific than large ones. Those of the bulk of the mastodons, megatheria, glyptodons, and diprotodons, are uniparous."—(Appendix to Classification and Geographical Distribution of Mammalia, page 56.")

But extinction is a law of nature; we find evidences of it throughout the whole record of Geology. Unlike, however, Mr. Darwin's hypothesis, all evidence is not hidden, but displayed by the organisms of past worlds, and is equally demonstratable by what we see passing before our eyes in modern times. If the natural selection theory were a law of nature, why should not geology and modern history be equally explicit?

Then as to the succession of new species, which Mr. Darwin attempts to explain by his theory.

"One might speculate," says Professor Owen, "on the gradual modificability of the individual; on the tendency of certain varieties to survive local changes, and thus progressively diverge from an older type; on the production and fertility of monstrous offspring; on the possibility, for instance, of a variety of auk being occasionally hatched with a somewhat longer winglet, and a dwarfed stature; on the probability of such a variety better adapting itself to the changing climate, or other conditions, than the old type,—of such an origin of *Alca torda*, for instance,—but to what purpose? *Past experience of the chance aims of human fancy, unchecked and unguided by observed facts, shews how widely they have ever glanced away from the gold centre of truth.*"—(Op. Cit., page 58.)

Divergence of character is another link in Mr. Darwin's chain. It is one of high importance to his theory. As species present well-marked differences throughout nature, he accounts for this by the lesser difference between varieties being augmented, constituting divergence of form. And here Mr. Darwin is obliged to give up the doctrine of chances. "Mere chance, as we may call it, might cause one variety to differ from another, and the offspring of this to differ from its parent in a greater degree; but this *alone* would never account for so habitual and large an amount of difference as that between varieties of the same species, and species of the same genus."

To prove this Mr. Darwin falls back upon *domestic* productions—obviously the very worst that he could choose, inasmuch as the variations of domesticity have no analogy whatever with the variations of nature. He tells us that one pigeon-fancier will breed all his stock from short-necks, and another from long-necks; and that a breeder of horses will, by always choosing swift horses to cross with, establish a swift race, as distinguished from the original slow one. It is almost absurd to reason in this way as a means of proving that species may be transmuted. I will venture to say, that where you have one variation in nature of a progressive character, you have a thousand that are retrogressive, and I can "easily imagine," as Mr. Darwin so frequently remarks, how various causes may conspire to degrade the original typical animal form, but I cannot imagine, from anything Mr. Darwin has written, a law of variation acting either constantly or intermittingly, either partially or universally, and producing changes in organic structure which lead to the transmutation of species.

I challenge Mr. Darwin, or any of his supporters, to give me one single proof from the animal world, where such a thing can either be proved or safely inferred. I believe the characters used by botanists to define species are often very unsatisfactory. But even among plants I think that no well-authenticated instance of transmutation can be proved, including

even the solitary species which was made so much use of by the author of the "Vestiges."

Among the assumed instances of transmutation, that of the *Ægilops triticoides* was considered the best. Hear what a close inquiry into the subject brings out:—"*Ægilops triticoides.* This plant, which was considered by M. Fabre as a stage in the transition of *Ægilops ovata* into cultivated wheat, has been shewn by Godron to be a hybrid procured from *Æ. ovata*, fertilized by the pollen of wheat. Regel in Germany, Vilmorin and Groenland in Paris, and Planchon at Montpellier, have confirmed this statement. *Ægilops triticoides* is generally sterile, but it sometimes bears fertile seeds. These seeds, when sown, have produced plants called by M. Fabre, *Ægilops speltiformis.* This has been shewn by Godron to be a hybrid between *Æ. triticoides* and *Triticum vulgare*, common wheat.—("Comptes Rendues," 1858.)

My friend, Dr. Maclean, who has all his life been making investigations into this subject, denies even a common origin to the cowslip and the primrose, and among the few strictly mule plants which he has produced, *he never knew an instance of fertility*, or obtained any satisfactory evidence of such a fact in either the animal or vegetable kingdoms.

Mr. Darwin admits that Gärtner and Kölreuter have devoted their lives to this subject, and he attempts to reason away the conclusion they have arrived at, which is, that sterility is universal

(Kölreuter,) or nearly so, (Gärtner,) in all hybrids.

Mr. Knight says, "I could adduce many facts which would satisfactorily prove that a single plant is often the offspring of more than one, and in some instances of many male parents. Under such circumstances every species of plant, which either in a natural state or cultivated by man, has been once made to sport in varieties, must almost of necessity continue to assume variations of form. Some of these have often been found to resemble other species of the same genus, or other varieties of the same species, and of permanent habits, which were assumed to be species; but *I have never yet seen a hybrid plant capable of affording offspring*, which had been proved by anything like satisfactory evidence to have sprung from two originally distinct species; and I must therefore continue to believe that there are no species capable of propagating offspring, either of plant or animal, now existing, which did not come as such immediately from the hand of the Creator."—*Physiological Papers*, page 253.

Surely this work of Mr. Darwin is an exception to every system of reasoning adopted by scientific men. All his arguments are founded upon exceptional cases, and the great broad facts of science he ignores with the most infatuated pertinacity. He thinks much of the old maxim, "*Natura non facit saltum*," but denies the equally true one "*Naturam expelles furca, tamen usque recurret.*"

On the subject of hybrids, M. Agassiz has some very pertinent remarks. He considers however, that the test of fertility should not be applied as trustworthy evidence of specific identity, so long as doubts may be entertained that "our dogs, and other domesticated animals and cultivated plants, are respectively derived from one unmixed species."

"Where," he asks, "is the unprejudiced naturalist, who in our days would dare to maintain First, that it is proved that all the domesticated varieties of sheep, goats, bulls, llamas, horses, dogs, fowls, etc., are respectively derived from one common stock. Secondly, the supposition that these varieties have originated from the complete amalgamation of several primitively distinct species, is out of the question," etc., etc. (Op. Cit, p. 251.)

Mr. Darwin however not only "dares" to go the length of inferring, that all the dogs and horses, etc., are derived from one common stock, but that the vertebrata, nay all living things have but one progenitor! But does he say, as Agassiz remarks, that these statements are proved? No such thing. He asks us to accept them as part of his theory upon mere assumption, and reviewers speak highly of the new doctrine of creation! He gives us a theory of the most improbable kind, supports it by others still less reliable, and then asks us to surrender all that science and philosophic investigation has affected up to this time. There is no *via media*

between the speculations of Mr. Darwin and the doctrine of special creation of living beings. If the former is adopted, the latter must be given up. What we have to decide is simply which doctrine stands upon the broadest and soundest basis. This is the question at issue, and that which naturalists must settle without delay.

At the end of the fourth chapter, Mr. Darwin attempts to illustrate his subject by the simile of a large tree. "The green and budding twigs may represent existing species; and those produced during each former year, may represent a long succession of *extinct* species. At each period of growth, all the growing twigs have tried to branch out on all sides, and to overtop and kill the surrounding twigs and branches, in the same manner as species have tried to overmaster other species in the great battle for life. The limbs were once budding twigs, and this connexion of the former and present buds may well represent the classification of all extinct and living species in groups subordinate to groups. Of the many twigs which flourished when the tree was young, only two or three, now grown into great branches, yet survive and bear all the other branches; so with the species which lived during long past geological periods, very few now have living and modified descendants.

From the first growth of the tree, many a limb and branch has decayed and dropped off; and these lost branches of various sizes may represent those whole orders, families, and genera, which

have now no living representatives, and which are known to us only as fossils. As we now and then see a thin straggling branch springing from a fork low down, and which by some chance has been favoured, and is still alive on its summit, so we occasionally see an animal like the ornithorhynchus or lepidosiren, which in some small degree connects, by its affinities, two large branches of life, and which has apparently been saved from fatal competition, by having inhabited a protected station!

As buds give rise by growth to fresh buds, and these, if vigorous, branch out and overtop on all sides many a feebler branch, so by generation I believe it has been with the great Tree of Life, which fills with its dead and broken branches the crust of the earth, and covers the surface with its ever-branching and beautiful ramifications." (pp. 129-30.)

I have quoted this simile at length, because it well expresses Mr. Darwin's views, and it equally well expresses my objections.

Let the tree be an oak, which has been standing for a thousand years. Then I say the root and stem represent the species a thousand years ago; the branches its various descendants; some have lived to propagate their kind, others have died, and are represented by the dead branches. Each descendant has become in the shape of a large branch the progenitor of other forms, but all of the *same species*. The buds bursting into leaf, under the sun of spring, represent the thousands

upon thousands of descendants from the parent stock. *There is no struggle for existence.* Each bud, and leaf, and branch has its allotted period of life, which, when passed, leaves behind it successors to form fruit, and then be carried to all parts of the world.

But the oak is an oak still. Look at the myriads of acorns, which stud every branchlet, containing within them the undying and eternal representative of the original stem, which rose up from its acorn a thousand years ago. Cut open your acorn, look at the embryo which is to be the future oak! There it is as perfect and as unchanged as when it first came from the Creating Will of an All-omnipotent Being. No secondary causes here. The stamp of the Creator's hand is indelibly fixed upon that embryo, and no time shall change, and no force shall divert it from the design, which fixed its position in the beautiful world of nature. Gather ten thousand million of these acorns from every part of the world, and you will find no evidence of change! The embryo will bud forth, and the radicle will strike into the earth, and the plumule will raise its fairy leaves to the morning sun, and it will grow and grow, and another oak will descend to a distant posterity, and bear evidence then of the permanence of species, of the unity of design, and of the ineffable power and wisdom and goodness of Him, who specially created it. For what? I can imagine I hear some one say.—For the use of man, the highest of all specially created

beings, is my answer. To carry him across the ocean to distant lands, and there to spread abroad the blessings of civilization, and to speak of Him among the heathen and the savage! Look again, I say, at that oak, with its myriads of acorns, you will find there is an abundance, greater than is needed for the propagation of the species; and some you will find wither and decay, and others are made use of by animals to live upon. Insects, too, pierce the leaves with their ovipositors, and produce one of the most useful articles of commerce. The bark contributes as much as perhaps any natural production to man's comfort and happiness.

Now are all these things produced by an accidental variation occurring myriads of years ago, and altered by successive changes and modifications? Or was that primeval acorn specially formed and created by God? I will allow no sophistry to convince me that secondary causes produced this tree. It is to me evidence of design, and of creation specially adapted to a special purpose, too strong to be rejected by any one whose reason is perfect.

And if this is so of the oak, how much stronger is the evidence of design in the attributes of reasoning man. It is indeed an enormous stretch of imagination to strain homologies into identities. What though the paddle of the whale, or the wing of the bird, has a similar arrangement of its bones to that of the human hand? Does it not merely shew that the same exquisite combination is made

in each to perform the same abstract end? In the fish and the bird that end is progression—the one through the water, the other through the air. In man the use is more varied, and the arrangement of parts is more varied also; but even as a means of progression how useful is the human hand! In running, walking, swimming, how much assistance is given by the hand of man; but it is destined for other purposes connected with a higher organization, and for which it is variously, beautifully, and inimitably adapted.

But beyond the mere expression of the same means of exercising a similar function, there is really no resemblance between these so-called homological organs. Why were the bones of the whale's limb made in the form of a paddle, except to propel it through the water? Why were the shaft bones of the wing of the bird made hollow, and filled with air, unless it were to give it buoyancy and lightness as a wing? Why were the bones of the human hand made in neither of these types, unless it were destined to form an organ for grasping, for prehension?

But then again look at Mr. Darwin's deduction that all lung-breathing animals have been derived from a type having an organ like the swim bladder of the fish? That the lung, say of man, the most exquisite and elaborate piece of Divine workmanship in the whole field of nature, should be merely an altered bag used by fishes generally for the same purpose as the hollow bones of the bird,—or in particular instances

affording them a supplementary means of respiration! The fact is, that without this swim bladder Mr. Darwin could not get on a step, because he knows full well that the gills of a fish,—the trachea of the insect,—the mantle of the oyster,—the beautiful respiratory sac of the ascidian,—the tentacles of the polyzoa,—although all made for breathing purposes, are only analogous to the lung, or, in other words, the type of organization is different and distinct. The swim bladder is the only, what is called *homology* to the lung of the higher vertebrata, which the great chain of animated beings will give him. But does not this display in strong light the utter want of support which Mr. Darwin's theory will get from known facts. If the organs I have mentioned, which are adapted to the functions of breathing, have no type in common with the lung, there can be no conversion of one into the other by Mr. Darwin's theory. He does not, however, pretend to get over this insuperable difficulty, but contents himself with the expression of a belief that lung-breathing animals were descended from an animal with a swim bladder,—the prototype, and all intermediate forms, being lost in the "imperfection of the geological record!"

I will conclude this chapter by adducing one or two instances of adaptation, which could only have been the result of a great intelligence, acting with forethought through the medium of special creation. Such proofs, it is true, crowd

upon us at every step we make in scientific investigations, and it is only because the subject has been considered exhausted by the Bridgewater treatises, that they are not brought more prominently forward. It is a common remark, why illustrate design—it is as evident as the ground we walk upon? To such a question the appearance of Mr. Darwin's book is a sufficient answer. It is quite true that Mr. Darwin remarks that when we talk of design, we merely re-state his own arguments. I will leave the intelligent reader to decide the truth of this remark. The very essence of Mr. Darwin's theory is utterly opposed to the operation of a Great First Cause, acting by special creation and pre-ordination.

As I have remarked before, variation, if it means anything, means a divergence from a normal form. Mr. Darwin peoples the world with beings by means of such an abnormity. He makes the Deity create a form perfect, which shall have a long race of perfect descendants, and then he introduces imperfection as the means by which new forms are made to appear in the world. If this is by design he must assume that the primary creation was imperfect, but endowed with an inherent power, by which it could produce individuals having within them the greater elements of perfection! Or, to illustrate it by another example. He must assume that every living thing on the earth is imperfect, which, in fact, he does, when

he states that he considers no living thing is destined to transmit its unaltered form to a far-distant posterity. If, then, the primordial being was imperfect,—and all the living beings now on the face of the earth are imperfect,—you can form no notion whatever of the perfection of Deity itself. Human reason consists essentially in the power of comparison, and just as we are able to understand what is good by comparing it with evil, or what is true by comparison of that which is false, heat by cold, wet by dry, and so on; so it is by a comparison of the works of nature, with our ideal notion of nature's Creator, that the argument from natural theology of the Creator's perfection is drawn. And if we cannot believe in the perfection of the Deity, how are we to believe that design, which is the most wonderful of all the natural evidences of the Godhead, can be a reality. It is no answer to this reasoning that secondary causes, as applied by Mr. Darwin to the "variation" of species, display Infinite Wisdom. Far from it! you can only compare Mr. Darwin's uncertain, partial, intermittent law of variation with the known facts of creative wisdom and design, by allowing a degradation of Divine Power, which I apprehend few will be found to admit.

If, for instance, as an anatomist, I look at the human hand or foot, I see the most exquisite adaptation of bone, ligament, muscle, blood-vessel, and nerve, each performing a separate function, and the whole constituting the most

wonderful and startling structure that my finite mind can conceive. As a physiologist I know that this hand and foot are as perfect as anything to which such a term can be applied. I know also, that, though formed on the same plan just as a mechanic will apply his lever, or his pulley, or his hinge, to accomplish very diversified works,—yet that this hand and foot are unlike anything else in nature. And further, I know by the study of the functions of the different parts in these structures, that if any part were removed or any added, that they would be imperfect and useless. Therefore I infer, first, that the hand and foot were designed by a being with thought, foreknowledge, wisdom, and goodness; and secondly, I compare by my reason, the work with the thought of its designer, and I thus form a certain and immovable impression in my mind, that that being is Perfect. As, however, I have no superiorly-formed hand or foot with which to compare those of man, I am not mentally competent to imagine that any similar structures could be more perfect; and as a comparative anatomist, I know that there is nothing lower in the scale that is identical with the hand or foot of man. My studies lead me to the knowledge that certain apes and monkeys possess four hands, made after the same model as my own; but I immediately recognise the fact that if those hands were removed to my body, and my hands and feet to the body of the ape, that, instead of two

perfectly-organized beings, each adapted to its position in the world, I should produce two monsters, totally incapable of existing in their allotted spheres.

Again, in examining the anatomy of the human body, I find that all the nutritious part of the food which is eaten by man, is collected into a long tube, called the thoracic duct, for the purpose of being conveyed into the blood, where it subserves the purposes of nutrition. Now I find this duct opening into the veins where two of them meet, one coming from the head, another from the upper extremity; and I see with admiration and delight that this important thoracic duct, upon which the existence of the being depends, opens *exactly* in the angle formed by the junction of the two large veins, and I know by other means of study that this angle is exactly the spot, and the only spot, in which the duct could open without the fluid regurgitating, and thus being impeded in its entrance into the blood! Well, I ask myself, was this the result of a chance, or even a pre-ordained variation? To the first question, only men without reason would say yes. The second must be true if Mr. Darwin's theory is sound. But then again, as a comparative anatomist, I carry my mind's eye down the scale of nature, and I come to forms in which there is no thoracic duct at all! Now, immediately my reason tells me that this ductless animal never could have been altered into one with the

beautiful provision made for the higher animals, as mentioned above, by a law of variation! That the change, if even made in an ascending series of organisms, must have been made by special creation, and not by "selection."

Going on still further in my enquiries, I look at the blood itself, which flows in the human veins, and placing it under the microscope, I find that it is composed of a vast number of round flat discs, floating in a clear watery fluid. Further examination shews me that between the two great systems of blood-vessels, the veins and the arteries, there is an intermediate net-work of fine delicate tubes, each about one two-hundredth part of an inch in length, and only capable of allowing the passage of a single blood-disc, which, according to the measurement of Gulliver and Wharton Jones, is one three thousand two hundredth of an inch in diameter, and twelve thousand four hundredth of an inch in thickness! What a beautiful thought of the divine architect is here, exclaims the student. How admirably adapted the disc for its tube, and the whole applied for the purposes of growth and the renewal of waste. But then, says the Darwinian, other animals have blood and capillaries as well. Why may not this admittedly beautiful adaptation be the result of successive "variations" by "natural selection?"

My answer to this question is, that it could not have been so for the following reasons:—

1.—The human blood-disc has special characters of its own, by which it can be distinguished from that of every other animal; so much so, that a good microscopist is able to swear in a court of justice that the stain he is shewn is that of human blood. 2.—Each class or genus of animals has also a specially-characterized blood-disc. Thus, that of the *Cervus Rerisii* is only one six thousand three hundred and thirtieth of an inch in diameter, that of the elephant one two thousand seven hundred and forty-fifth of an inch. In birds, reptiles, and fishes, they are no longer circular, but oval. In birds the long diameter is one two thousand and fifth, by one three thousand three hundred and sixty-ninth. In frogs one thousand one hundred and eighth long, by one thousand eight hundred and twentieth short. The corpuscle of the proteus is twice as large as that of the frog, which is three times as large as that of man! Among the invertebrate class, the blood corpuscle of the earth-worm is a thousandth part of an inch in length, by one thousand two hundredth broad. The leech one three thousandth long, by one three thousand six hundredth broad.

Surely a contemplation of facts like these must set at rest for ever the possibility of any "variation" of structure being at the foundation of the origin of species.

Still keeping to the anatomy of the human body, I might carry the blood into the lung, and describe the various processes which are

undergone there in the production of animal heat. I could point out how admirably adapted is that exquisite organ, the lung, to perform this function. How it is provided that on the average at least twenty-six pounds of blood pass through these organs every three minutes and a half of our existence, from the cradle to the grave. How of this twenty-six pounds at least one-sixth is composed of blood-discs, each of which is only the three thousand two hundredth part of an inch in diameter, and each of which has to pass separately from artery to vein, and along the capillaries every three minutes and a half. And I could then ask the reader to follow me down to fishes, where all traces of a lung cease, and from them through the great scale of living beings, in which there is not only no vestige of a lung, but as we get lower and lower, not even any vestige of a special respiratory apparatus at all; and then, I might triumphantly ask, where is the possibility that this exquisite organ, the lung, could have been produced by variation in beings in which not a vestige of it existed? But all this would occupy too much space, and I must therefore proceed with one or two more illustrations of adaptive design.

Well then, there is a very obvious and beautiful instance of it which fell under my notice while reading a few days ago researches into the minute anatomy of the nervous system, by the celebrated Van der Kolk.

In the class Mammalia only, there are situated on the anterior and lateral aspect of the medulla oblongata, two masses of nervous matter, termed the *Corpora olivaria*. Now these bodies are much smaller in animals than in man. In the latter, according to Valentine, they are about five by three Parisian lines. In the chimpanzee they are only two lines in length. Now these small nervous masses are intimately connected with the function of speech; but they have also another use, because they exist in animals which do not talk, and they are connected in man with other portions of the medulla which preside over other functions. In examining the medulla of the cow, Van der Kolk was astonished to find two of these bodies on each side. In two apes, the *Cercopithecus cynomolgus* and *Cynocephalus papio*, he found them single, but smaller than in man, and commencing higher up, but, like those in man, they extend to the inferior roots of the hypoglossus nerve, and are connected with it. In the cat, dog, rabbit, *Caria aguti*, horse, ass, and cow, they are double,—the upper one being in connection with the facial nerve, the lower one with the hypoglossal nerve. In structure both these olivary bodies in brutes are the same as in man, with the exception of forming fewer convolutions, and having only a feeble trace of a hilus. Van der Kolk found that the superior olivary bodies differ considerably in animals. They are more highly developed in beasts of prey than in the rodentia,

and are still smaller in the herbivora.

Now Van der Kolk clearly makes out that in addition to the known function of presiding over articulation and speech, these bodies especially are connected with those muscles of the face by which the passions are expressed. Thus in the beasts of prey these bodies are highly developed, and the expression of the passions is much stronger in the carnivora than in the herbivora, as shewn by Bell.

The muscles which produce the snarling expression of a dog or wolf, are wanting in the herbivora, in which as well as the ass, which has very little expression, the *Corpora olivaria*, are small. In the seal, whose skin is so unyielding, that no expressive movements take place, the *superior corpora olivaria are entirely wanting.*

Now I should like to be informed by any of Mr. Darwin's disciples how he accounts for this difference in an important structure, even in animals closely allied, unless by special adaptation in a special creation? It would be perfect nonsense to argue that nervous matter, which presides over certain movements, could be altered by use, because we have seen that it in fact causes these movements. Equally absurd would be the argument that they could be produced by any correlation of growth. In fact it is utterly impossible that the same form could ever vary so as to exhibit permanent alterations of this kind without special creation. To suppose that natural selection could do it, is to indulge

in a dream of useless and unintelligible speculation.

I copy the following from the "Edinburgh Philosophical Journal, for April, 1860:"—"*Wellingtonia gigantea.*—But if the wood is fresh the bark is not. Our friends found it a great deal worse to cut through than wood. It is tough and stringy, like coir or the husk of coco-nut, and is from a foot to a foot and a half in thickness. We have here one of those beautiful adaptations of structure to purpose which delights the mind to trace. It is obvious that if the *Wellingtonia*, being so fragile, were coated with bark of only a common thickness and ordinary consistence, *it never could live to be a tree*; it would be snapped across by the first wind that blew, so soon as it reached a sufficient height to give the wind a hold upon its branches; but with a coating of bark so thick, so tough, so stringy, so spongy, and so elastic, it is kept in its place, and *protected from its own fragility*, and, as has been pointed out to me by my intelligent friend Mr. Bryson, this support is given in the way which modern science has *ascertained to furnish the greatest amount of strength with the least waste of substance*.

The bark is constructed on a different plan from that of most other trees; it is on the plan of the corrugated roof, running longitudinally round the tree; the corrugated layers are composed of harder texture, and the interstices are packed with an elastic spongy substance.

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Another adaptation of structure exhibited in this tree is the great gnarled expansion of its trunk at the base, which may be seen in the plate and vignette, thus supporting it against the wind by what may be called a circle of buttresses." —Mr. Murray, in "Notes on Californian Trees," in "Edinburgh New Philosophical Journal, April, 1860."

Here is another extract from the same Journal: —"Comparing the growth of the swallow fed by the parent birds, with that of the young of the turkey, common fowl, and goose, which have to find their food, a marked difference is observable, the growth of the one being so much more rapid than that of the other. Again, if we compare the eggs of these birds, which feed their young till they are capable of taking wing, with the eggs of those which have to provide for themselves, the latter will be found proportionally larger.....How little, as regards size, does the egg of the eagle differ from that of the goose; how very small is the egg of the cuckoo compared with that of the partridge, the latter birds differing but little in size. And is there not design in this, as well as in the different degrees of rapidity of growth? Is not the gosling during the first days of its existence, after leaving the egg, more dependent for nourishment on the residual included yolk than the eaglet? and is it not so in other instances.

In the mammalia there appears to be a relation between the period of growth required for the

attainment of their maximum power, and their duration of life; but in birds this relation seems to be entirely set aside; and is it not because a rapid attainment of their full power is essential to their existence?"—Dr. John Davy, on the "Growth of Birds," Edinburgh New Philosophical Journal, April, 1860, p. 262.

CHAPTER VI.

THE "Law of Variation" is the title of Mr. Darwin's fifth chapter, and he commences it by repudiating the charge that he has been advocating the doctrine of chances as the cause of variation. He considers the change as one produced by "an alteration" of the reproductive system, to which the parents or their remote ancestors have been subjected. In other words, we are "profoundly ignorant" of the whole subject.

It is however eminently necessary to Mr. Darwin's theory, that the *known* causes of variation should have *little* influence—the *unknown much*. Therefore the effects of climate, food, etc., Mr. Darwin considers slight. But surely cabbages, celery, the potato, asparagus, cucumbers, various fruits, all our cultivated flowers and domestic animals can be brought in strong array against him. Here we see before our eyes every day the effect follow its cause with perfect uniformity. Mr. Darwin prefers however his "selection" or unknown cause to those which are obvious as daylight.

Use and Disuse are also dealt with by Mr. Darwin, and here he treads upon ground already occupied and used up by Lamarck. He thinks that birds which are found in oceanic islands in a nearly

wingless condition, are so by virtue of the disuse of their wings, in consequence of no animals of prey living thereon. The difficulty of the Ostrich, which does live without wings, and among beasts of prey, Mr. D. gets over by imagining that its early progenitor had habits like a bustard, and that "as natural selection increased in successive generations the size and weight of its body, its legs were used more, and its wings less, until they became incapable of flight!"

And yet in the same chapter, which contains this improbable absurdity, Mr. Darwin denies that his laws of variation have anything to do with "chance." But what a strange power is this which Mr. Darwin substitutes for "creation." It first develops wings in an ostrich's progenitor, and then allows them to dwindle away as useless appendages!

Wingless beetles in Madeira, the eyes of moles, the Styrian cave animals, which, living in darkness are blind, all in turn receive Mr. Darwin's notice, and are adduced as instances of the retarded development of organs owing to disuse in progenitors.

This subject has been well handled by Mr. Murray, in a late number of the "Edinburgh Philosophical Journal," and these very blind beetles are adduced as evidence against Mr. Darwin, for it is certainly upon his theory inexplicable that cave beetles should be found in various parts of the world, and of species closely allied, yet different, and yet in all cases blind. How can this

be reconciled upon the hypothesis of a common origin for creatures destined to live for ever in a dark cave, and not likely to "emigrate," or get upon a "glacier." In fact I think Mr. Murray's argument is unanswerable.

The following is an extract from Mr. Murray's paper, (Edinburgh New Philosophical Journal, No. I., January, 1860, page 149:)—"The most striking fact, and the one which to my mind disposes of the whole matter, is the existence of species of the same genera of eyeless insects, existing in the vast subterranean isolated caves of Carniola, allied, and exceedingly closely allied to similar species in the caves of Hungary; to similar but different species in the caves of the Pyrenees; to similar but different species in the caves of Auvergne; and more than all to similar but different species of the same genera in the mammoth cave of Kentucky. Each of those set of caves has a different set of species of the same genera, and all very closely allied. The physical condition of the place being the same, the product has been the same; but not by immigration, nor any means of distribution which we can imagine. Can identical species, (for remember the theory implies that congenerous species are identical, or, what is the same thing, their descendants,) be found in caves so widely separated; and it is not the common case of congenerous species found very wide apart, which may yet have traversed the intervening space, because these insects *are found nowhere but in caves*, and not in them until you have

penetrated far—far into the interior, usually about a couple of miles. Another instance may be drawn from our own coasts. We have a small beetle, which lives here between high and low water mark, *Aëpus fulvescens*, between the leaves of shale. A closely allied form, but quite distinct, *Thalasobius testaceous*, is found in like circumstances on the coast of Chili. Here again like physical condition, like product. Take another instance;—of late years ants' nests have been found to contain a considerable number of species of beetles, which live with the ants, are often excessively like them, and sometimes are unprovided with eyes. The same peculiarity prevails here—*allied species and nothing but allied* species in ants' nests, wherever they are." "*Further, it were easy to draw abundance of proof of the fact, that congenerous species are at all events always found in similar physical conditions of life.*"

But does Mr. Darwin suppose that the Creator, who placed these creatures in the spot destined for their home, was likely to give them organs which they were never to use? In the case of moles, there are times when for their personal safety a certain degree of sight is necessary, and therefore it is given to them. But if disuse will deprive an animal of its wings, why do they not disappear in our ducks, geese, and poultry?

Certain female insects have no wings, or only rudimentary ones. The object of their existence is to deposit their eggs, and then they die; and this is observed in some species of moths of all

sizes, from the Psyche up to Nyssia. Now why should this be so? Why should some of these female moths have wings, while others are entirely apterous? And why is the instinct of the male moth so unerringly correct in leading him to the resting-place of his mate? Mr. Darwin may call these variations accidental alterations, which have been perpetuated for the "good" of the insect by "natural selection," etc.

For my part, I should conceive such an explanation to be not only bordering upon impiety, but in the highest degree improbable, and quite as unlikely to be the true one, as that the same law first gave a bird wings, and then deprived it of them by natural selection. I see nothing in nature so bungling and slovenly as this. I observe the most perfect harmony in all she does: and if in some instances I cannot understand what I see, I am content to place this to the account of that imperfection which must ever be attached to a finite mind, when it attempts to unravel the mysteries of the infinite.

Acclimatization is dismissed in a few words. Mr. Darwin considers that the period of flowering, the amount of rain required for the germination of the seed, and the sleep of plants, is due to "hereditary habit,"—a statement certainly not less extraordinary than a hundred others in this very extraordinary work. Fancy a flower getting a "habit" of shutting its petals, and going to sleep at a certain hour every day, irrespective of weather! I confess that when, as I have often

done. I have contemplated with pleasure the order and regularity with which this is effected by flowers, I never dreamt of such a thing as "habit" having anything to do with the process. Why not say that the sleep of the animal is a "habit." A seed is kept in a dry mummy case for two or three thousand years without germinating; you give it moisture, and so enable certain chemical changes to take place, and the seed grows. This so-called habit then is a *law of nature*. It suits Mr. Darwin, however, to propound the doctrine, that because plants transported from one climate to another, become acclimatized or "habituated" to different temperature, they do this by "habit;" and he raises this extraordinary theory to get over the difficulty in his way, of species of the same genus inhabiting very hot and very cold countries! If they do this by "habit," he at once claims the fact as "being effected during long continued descent from a single parent!"

If however they are adapted to different climates by a natural law, implanted in them when specially created, there is, of course, an end to Mr. Darwin's hypotheses, and the whole theory of his book falls to the ground. To support his view, he mentions the limited evidence of Dr. Hooker's rhododendrons, raised from seed, gathered at different heights in the Himalaya mountains, being found in this country to possess different constitutional powers of resisting cold; and similar results have been communicated to him by Mr.

Thwaites and Mr. H. C. Watson, of plants from Ceylon and the Azores.

As no references are given of these experiments, it is presumed they are not published, and consequently cannot form part of my argument.

The cases of migration of animals from warmer to cooler climates are merely given on hearsay, and we shall see hereafter the glacial theory brought forward to account for the wide separation of species from their assumed centres of origin.

Correlation of growth in this chapter receives a more extended notice than it has hitherto done, and some of the more remarkable views held by Mr. Darwin are developed. The points detailed in the first part of the chapter I have before alluded to. I will confine myself now to the consideration of two propositions which rise out of Mr. Darwin's views of correlation, and upon which he lays much stress.

1.—"*A part developed in any species in an extraordinary manner, in comparison with the same part in allied species, tends to be highly variable.*"—(Page 150.)

Here Mr. Darwin is obliged from the limit of his work, to defer the facts upon which he intends to support this proposition. This is unfortunate, because in the outset it is clear that it bears strongly upon the unavoidable result of Mr. Darwin's views, that the human race is only a modification or higher development of that of the ape. Mr. D. infers that Mr. Owen is a believer in the proposition, from an observation

made by that distinguished comparative anatomist with respect to the length of the arm of the orang-outang.

I cannot do better than give Professor Owen's views with regard to the Gorilla, both as an answer to the above, I think, very unfair inference of Mr. Darwin, and also to set at rest, as far as can be done by the highest authority, and a deduction of the soundest character from facts, the transmutation doctrine itself. The evidence now to be adduced in fact breaks down Mr. Darwin's theory altogether. It is so complete an answer to the book, though published before it, that I might lay down my pen did I not think it an act of fairness to go through the whole.

The Gorilla is the most anthropoid ape known, according to Professor Owen. In this opinion however, it is right to say that other comparative anatomists do not concur. Dr. Wyman, Professor of Anatomy, Boston, U.S., and Professors Duvernoy and Isidore Geoffroy St. Hilaire, of Paris, concur in ascribing the nearest approach to man to the chimpanzee. Professor Owen's analysis however of the entire question, (which may be seen either in the Proceedings of the Zoological Society, Part I., January to March, 1859, or in the Appendix to his "Lecture on the Classification of the Mammalia." Parker and Son, 1859,) is a masterly specimen of scientific induction and sound reasoning.

There are three apes, all inhabitants of the

old world, which approach more or less in structure to that of the human race. 1st.—The chimpanzee, the *Homo troglodytes* of Linnæus, more correctly named by Blumenbach, *Simia troglodytes*. 2nd.—The orang-outang, or wood-man of the natives of Borneo, from whence the creature was first procured. 3rd.—The Gorilla, or, as it is named by Owen, *Troglodytes gorilla*, which was discovered in 1847, in the Gamboor river, in the west coast of Africa, by Dr. Savage, a missionary, and described by Owen in the Transactions of the Zoological Society for 1848. This latter creature has since then been received dead in England, and there are two stuffed specimens in the British Museum. All about its structure and habits will be found in the works alluded to by Professor Owen; or a very good description may be obtained for sixpence, in one of the early numbers of "Cassell's Illustrated Natural History."

It is not my intention here to enter into a detail of the anatomy of this creature. I will however relate the results of Professor Owen's researches. I may state that a fourth ape, the Gibbon, has been considered by Lartet, a French palæontologist, as approaching nearer to man than the others, and this opinion has been accepted by Sir C. Lyell, (Supplement to Fifth Edition of "Manual of Elementary Geology," 1859, p. 15.)

It is sufficient to state that Professor Owen has clearly proved that the Gorilla is the most anthropoid ape; but it matters little to the argument which of the four is assumed to be, for

they are all physiologically and anatomically distinct, and widely so from the human form.

The chief distinctions between the Gorilla and man are 1st.—The almost total absence of neck. 2nd.—The backward junction of the head to the trunk. 3rd.—The great length of the cervical spines. 4th.—The projection of the nape beyond the occiput. 5th.—The great size and elevation of the scapulæ. 6th.—The oblique rising of the clavicles from their sternal attachments to above the level of the angles of the jaw. 7th.—The brain-case low and narrow. 8th.—The lofty ridges of the skull making the cranial profile pass in almost a straight line from the occiput to the super-orbital ridge. 9th.—The ears much smaller in proportion than those of man. 10th.—On a direct view of the face the ears are on the same parallel with the eyes. 11th.—Hugely-developed canine teeth enabling it to match its great strength with the lion. 12th.—*In the greater development of the limbs.* 13th.—The arm and fore-arm preserve a uniform thickness from shoulder to elbow, and from elbow to wrist. 14th.—The leg increases in thickness from knee to ankle. 15th.—There is no calf.

16th.—The thumb only extends a little beyond the base of the proximal phalanx of the fore-finger, while in man it extends to or beyond the middle of the first phalanx of the fore-finger. 17th.—The fore-arm passes into the hand without forming a wrist, and is fourteen inches in circumference, vice eight inches in a strong man.

18th.—Great breadth and thickness of the hand. 19th.—Shortness of the digits. 20th.—Circumference of digit five inches and a half, vice two inches and three-quarters in man. 21st.—The thumb is scarcely half as thick as the fore-finger. 22nd.—The thigh above the knee is thicker in proportion than in man. 23rd.—The thigh is only eight-ninths of the length of the humerus; in man it is one-sixth longer. 24th.—The foot is more like a hand than it is in man. 25th.—Man has twelve pairs of ribs; the Gorilla has thirteen. 26th.—The canine teeth are largely developed; the bicuspids are implanted by three distinct fangs; in the human race by two. 27th.—*The canine teeth are developed permanently in the Gorilla, but only in the male sex, when the animal is still nourished by the mother, shewing that its future condition is designed.* In man there are no sexual distinctions in the teeth.

28th.—The ape is a four-footed or hand-footed animal; man is the only being in the world formed entirely for the erect posture. 29th.—The inner toe, the first to dwindle and disappear in brutes, is developed in man into a great toe, by which he has that co-ordinate motion with the heel, which gives elasticity to his step. 30th.—In man there are in the foot two bony arches, one formed by the tarsal and metacarpal bones, the pier of the arch being at the heel and great toe; the other arch transverse to this, is formed by a combination of the cuneiform and cuboid bones. *But there are no such*

modifications in the Gorilla, or other apes. 31st.—The lower limbs in man are longer in proportion to the trunk than in any other mammalian animal. 32nd.—In no animal is the femur so long in proportion as in man. 33rd.—In no animal does the tibia expand so much at its upper end. 34th.—In man only is the innermost condyle of the femur longer than the outermost. 35th.—The pelvis in man is formed of shorter iliac bones than the Gorilla; they are more bent forwards, and are more expanded behind to give attachment to the glutei muscles, which are developed to a maximum in man. 36th.—The tuberosities of the ischium are rounded, not angular, and not inclined outwards, as in the Gorilla and ape tribe, and the symphisis pubis is shorter. 37th.—The vertebral column of man is designed for a creature to walk erect.

38th.—The arms of man are brought into more symmetrical proportions with the lower limbs, and their bony framework shews all the perfections that have been superinduced upon it in the mammalian series, namely, a complete clavicle, a broad scapula with the glenoid articulation turned outwards, the clavicle bent in a sigmoid flexure, the humerus exceeding in length the bones of the fore-arm. The carpal bones are eight. The thumb in man is developed far beyond any degree exhibited by the highest quadrumana, and is the most perfect opposing digit in the animal creation. 39th.—The skull of man is distinguished from every other animal by (a) the

enormous expansion of the brain-case; (b) the restricted growth of the bones of the face, especially of the jaws, in relation to the small equally-developed teeth; and (c) by the early obliteration of the maxillo inter-maxillary suture.

40th.—The skull of man is further distinguished from all apes, or other animals, by the peculiar and beautiful manner in which it is balanced on the neck, and the articulation is so designed as to protect parts, the slightest injury to which would cause instant death. 41st.—Man has not the strongly-developed frontal crest seen in the apes—a structure which no muscular power, as effects of use or disuse, can possibly be supposed to produce, and which is therefore a pre-ordained peculiarity in the ape. 42nd.—There are no bony crests on the upper convexity of the human skull. And to these distinctions may be added 43rd.—The brain of man is the only organ of the kind in the animal world, which can be placed in the mammalian division Archencephala, (from *archo*—to overrule, *encephalos*—brain.)

44th.—With this peculiarity of structure, and form of brain, is associated in man the highest of all intelligence—reason. Man builds himself a house, and can improve it: the Gorilla slings a hammock in his tree, which he never encloses with a roof or improves.

Now the peculiarities I have above mentioned as distinguishing man from the quadrumana, are not observed between the different varieties of

the human species. The human race differ 1st. —"In size from the Bushmen and Laplander, who are four to five feet, to some of the Germanic and Patagonian Indians, who are six to seven feet." 2nd.—"In colour they differ extremely, but we know how much of this is due to climatic causes. The Jews, for instance, for the last eighteen hundred years, have been a dispersed and wandering race in all climates, and they have remained a *distinct race*. There are however Jews still living in the Valley of Jordan, an oppressed and ill-used race, *who are as black as the Ethiopian*." 3rd.—"The differences in the bony structure are almost confined to the pelvis and cranium, the former is a slight but constant difference, the latter clearly traceable to the effects of mental culture upon the size of the brain; the pre-maxillary bone is only found to exhibit a marked suture or distinction from the maxillary in very early fœtal life, while in the chimpanzee and orang it may be observed in the latter, at least as late as the second dentition." 4th.—"On a comparison of the basis of the skulls of *all human varieties*, the strictly bi-manous character of the *position of the foramen magnum, and occipital condyles is observed* equally well displayed in the highest as the lowest."

Upon these and other more detailed grounds, Professor Owen has come to the conclusion that MAN FORMS ONE SPECIES; "and in no case can a well-marked definite line be drawn between the physical characteristics of allied varieties, these

MERGING MORE OR LESS GRADUALLY THE ONE INTO THE OTHER."

Professor Owen admits that the skeleton is, to a certain extent, modificable by the action of muscles, as is seen in the growth of the skull in young carnivora, or the sternum of the young bird. But he remarks, "The prominent superorbital ridge of the Gorilla is not the consequence or concomitant of muscular development, *as there are no muscles attached to it.*" "It is characteristic of the genus *Troglodytes* from the time of birth to extreme old age." The equable length of the human teeth, the absence of any break in the series, and any sexual development of particular teeth, he regards *as primitive and unalterable specific peculiarities of man.* "The crown of the great canine tooth of the male *T. Gorilla began to be calcified when its diet was precisely the same as the female*, when both sexes derived their sustenance from the mother's milk." "The whole crown of the great canine is in fact calcified before it cuts the gum, or displaces its small deciduous predecessor; the weapon is prepared *prior to the development* of the forces by which it is wielded; it is therefore a structure forg-ordained, a pre-determined character of the great ape, by which that creature is made physically superior to man; and one can as little conceive the development of the canine tooth to be a result of external stimulus, or as being influenced by the muscular actions as the development of the stomach, or of any internal gland."

The same remark applies to the divergent fangs of the pre-molar teeth. "There is not, in fact, any other character than those founded upon the developments of bone, for the attachment of muscles, which is known to be subject to change through the operation of external causes; *nine-tenths therefore of the differences*, especially those very striking ones, manifested by the pelvis and pelvic extremities, which I have cited in the memoirs on the subject published in the Zoological Transactions, as distinguishing the gorilla and chimpanzee from the human species, *must stand in contravention of the hypothesis of transmutation* and progressive development, until the supporters of *that hypothesis are enabled to adduce the facts and cases which demonstrate the conditions of the modifications of such characters.*"

I have been anxious to shew in a condensed form the opinions upon this all-important subject of the highest living authority; and no one can read this book without thanking God that the cause of Science and Truth is supported by a pillar like that of Richard Owen—a man whose name will live long after the propounders of unsound theories and hypotheses, unsupported either by fact or scientific truth, shall have been consigned to the same category of writers as those who believed that geese were produced from barnacles.

I have given these extracts at length, because the same mode of reasoning which applies to the

differences between the ape and man, applies with even greater force, to all other separate and distinct organisms.

If there are these insurmountable differences between creatures having so much in common as the ape and human species, how much greater must be the difference between the radiate and mollusc, between the crustacean and the fish, the reptile and the bird, or the bird and the mammal? or between the different genera and orders of the sub-kingdoms of the animal and vegetable world.

How utterly indefensible are the speculations of Mr. Darwin, when *the clear and unmistakable and unanswerable facts of Science* are brought to bear upon them.

CHAPTER VII.

I PASS on now to a further consideration of Mr. Darwin's rule, as detailed in the first proposition, and from which the necessary digression about the apes has for a moment taken me. Mr. D. tells us this rule is of high generality, but only applicable when the part, however unusually developed, is so in comparison with the same part in allied species. Thus Mr. D. thinks the bat's wing is a most "abnormal" structure in the class mammalia, but his rule does not apply to bats, because there is a whole group of these animals with wings! Mr. D. gives one example of the rule from the Cirripides, namely, the opercular valves of the rock barnacles are in every sense very important structures, and differ little in different genera; but in Pyrgoma they differ greatly, and the individuals of several of the species differ more from each other in these characters than species of distinct genera.

Mr. Darwin says the rule applies strongly to birds, but gives no examples. *It fails however in plants*, because it is "difficult to compare their relative degrees of variability."

Having given the above most meagre and unsatisfactory reasons for believing in a law of the greatest importance to his theory, Mr. Darwin begins to generalize upon it, and turn it to ac-

count. He can see no explanation of the fact in special creation, but can easily understand it on the view that groups of species have descended from other species, and have been modified by "natural selection." In the earlier part of the volume, and frequently in its course, Mr. D. dwells upon the enormous number of generations necessary to produce the transmutation of species. He now, however, thinks that an extraordinary amount of modification, though large and long-continued, implies that this has been within a period not excessively remote, "as species very rarely endure for more than one geological period." This statement is made to account for the "variability" of one organ, as compared with "other parts of the organization, which have remained for a much longer period nearly constant."

Going onwards, Mr. D. states "that the most abnormally-developed organs may be made constant, I can see no reason to doubt." Thus, "the wing of the bat having been transmitted, in approximately the *same condition to many modified descendants*, must have existed, according to my theory, for an immense period in nearly the same state."

Now I think it is impossible to conceive a more unsatisfactory mode of arguing out a question than this. Because the wing of the bat does not vary and support Mr. D.'s theory, therefore it is an abnormity.

This large family of most useful insectivorous creatures, found in all parts of the world, and

in a great variety of forms, placed, as we have seen, according to its organization, very high in the scale of mammalia, is an abnormity—a monster—something altogether unnatural, because it does not support the doctrine of natural selection!"

Having given us no proof of this variability, in what he calls abnormal parts, and having thus disposed of an objection which is clearly fatal to his theory, Mr. Darwin very complacently asks, How is this to be accounted for, on the view of each species having been independently created? Now, as I do not admit that any part of organic structure in the whole world is abnormal, but that everything is specially adapted to its purpose by a wise Creator; and as my faith has not been in the least shaken by any of Mr. Darwin's arguments, or mode of reasoning, I need not of course take any notice of a question which sufficiently answers itself. Neither need I notice Mr. Darwin's remarks about what he calls secondary sexual variability. I proceed to his second proposition.

2nd.—*Distinct species present analogous variations; and a variety of one species often assumes some of the characters of an allied species, or reverts to some of the characters of an early progenitor.*

I do not see so much objection to this proposition, as I do to the inference which Mr. Darwin draws from it. And here I may make a remark, which is applicable to almost all the book. Mr. Darwin frequently illustrates the vari-

ations of the *same or assumed species* to prove a great theory, which he has raised, of the community of origin of all species. In one case the fact of the variation is admitted, as in the Swedish and the common turnip; or the descendants and varieties of the rock dove under domestication; to which may be added all our domestic cattle and garden productions. In the other case it is not only not admitted, but believed by naturalists to be impossible.

Thus, Mr. Darwin talks of analogous variations of the fancy pigeon, as breeding back to the rock dove, their supposed ancestor. But this goes no way to prove the supposition that an eagle and a pigeon had the same origin. And because the ass has sometimes transverse bars on its legs, like the zebra, or the dun horse the same bars on its legs, or a double shoulder stripe on its shoulder, is Mr. Darwin justified from this in saying, as he does, that the zebra, the horse, and the ass have had the same origin? Why does he not adopt the much more probable theory, that being members of the same genus, and having their nutritive organs upon the same type, there may be in each a tendency to a similar deposit of pigment in similar structures. That it is highly exceptional Mr. D. does not deny. But he may, if he chooses, claim a common origin for the zebra and the ass, which would at once account for his exceptional cases of sporting back in the latter. But then I meet him with the question, Does the produce of the ass and the zebra breed?

If he says no, then I remark that this test is held by observers to be a mark of distinctness of species; but all experiments prove the fertility of crosses between the same species or their varieties, the produce of the latter breeding back.

While these sheets are passing through the press, I observe the following pertinent remarks, by an intelligent correspondent of "The Field," for July 14th.:—"Have any of your readers tried to perpetuate a cross not between species but varieties? If they have they will know that to perpetuate to perfection *is next to impossible*. Take, for instance, the first cross between a short-horn and Alderney, and you will have an animal that, in my opinion, combines the qualities most desired by the dairymaid and the butcher. *Try and perpetuate that cross, and failure is the result; it being an established fact, that to obtain a decent animal you must breed back* with one or other of the original stocks." Naturam expelles furca, tamen usque recurret!

Therefore, I say that experience and experiment, and the observation of such men as Mr. Knight, and a host of others, are utterly opposed to the possibility of the ass and the zebra, and *à fortiori* of the ass and the horse, being descended from a common parent.

I write this with full knowledge of the facts stated by Geoffrey St. Hilaire, and quoted further on, because it is quite clear that that distinguished philosopher is opposed altogether to any

deduction being drawn from the exceptional cases, which he finds do occur to this rule, and the same remark will apply to the views of Agassiz.

Mr. Darwin says that to believe, because the hybrid of the ass and the hemionus is like a Welsh pony, in having three shoulder stripes, and even some zebra-like stripes on the sides of the face, which are similar to the striped Kattywar breed of horses—to believe, he says, that animals were created with a tendency to vary thus, "makes the works of God a mere mockery and deception."—(Page 167.)

But before I can be satisfied that Mr. Darwin's theory is not a "mockery and deception," I must have something much more like proof than he offers of his natural selection, and so-called partial and inconstant law of variation. And I must demur to the inconsistency of adducing the fact, (assuming it to be true,) that members of the same family shew features similar to other members specifically distinct, under peculiar circumstances, like those given above, to prove that they were not specially created!

According to Mr. Darwin's theory, of a common origin to all vertebrated animals, why should the next group, the Ruminants, not run back to the horse? or the elephant to the whale? or why not be marked by some of the gaudy colourings of the bird, or the sparkling splendour of the fish? Or why should there not now and then be born an oviparous mammal from the ox, or

a gill-breathing fish from a flying squirrel?

How opposed also to sound induction is the statement that an immense group, like that of the mammalian, including forms so different, should have had a common origin, and then illustrating the idea by some resemblance between the members of the smallest order of the class, containing in fact but one family. Why not shew us a sport back to the horse or the ass in the camel, the elk, the giraffe, the antelope, the sheep, goat, buffalo, or ox?

Absurd as these questions may appear, they are justified by Mr. Darwin's views. "No doubt," he says, "it is a surprising fact that characters should re-appear after having been lost for many, perhaps for hundreds, of generations." (Page 160.) But why if hundreds, not thousands? Who but the hand that made and designed, shall dare to limit? Mr. Darwin has not left us in doubt upon this question. He says, at page 161, "As all species of the same genus are supposed, on my theory, to have descended from a common parent, it might be expected that they would occasionally vary in an analogous manner."

But then, while we are forbidden to confess our ignorance of the laws of special creation, or the interpretation of the Divine mind, we are told that "Our ignorance of the laws of variation is profound. Not in one case out of a hundred can we pretend to assign any reason why this or that part differs, more or less, from the same

part in the parents."—(Page 167.)

We now arrive at the sixth chapter, in which Mr. Darwin meets many of the objections urged in the preceding pages, under the head of "Difficulties on Theory." No one knows better than Mr. Darwin, the many difficulties that beset his path in endeavouring to establish a theory so wild and improbable as that which he has advanced. It might be expected, therefore, that he would here and there overhaul these objections, and place them in as favourable a light as he can for his case.

1.—*The absence or rarity of transitional varieties* is the first difficulty which Mr. Darwin deals with.

He answers it by bringing into play two of the pillars of his theory, neither of which, in the sense used by Mr. Darwin, have been proved. He says that "extinction" and "natural selection" going hand in hand, will, in "the very process of formation and perfection of the new form," exterminate all the others. That they are not found in a fossil state, he believes to be owing to the "imperfection of the geological record."

What a crowd of objections rise to the mind in reading these very unsatisfactory answers. Let any naturalist look at whatever group he chooses in the six great classes of organized beings. Let him extend his examination to the still greater divisions of orders, families, genera, and species. In the enormous mass of living things, he will find some imagined anomalies

for which he cannot account, some imperfections which he cannot understand. He, for instance, may think it an anomaly that the bat, which is a mammal, should have wings; but when he sees it feeding at night upon those crepuscular and nocturnal insects, which would otherwise prove injurious to man, and when he further considers that to fly, and see, and feed at night, must require an organization and structure adapted to a life during the day in holes and crannies, and therefore a mammalian mode of propagation, instead of an oviparous one, how changed becomes the almost impious thought of such a structure being an imperfection or anomaly in nature! It would, in fact, require volumes to explain what at first sight appear abnormal in living beings. But how few are the real or apparent anomalous forms, when compared with the great mass of living beings, each adapted to its sphere of life, and clearly designed for the position it occupies in the scale of existence!

Look at any one order with the eye and knowledge of a comparative anatomist, and observe the unity of type in structure, yet with such a difference in form, and habit, and mode of life. Take, for instance, the carnivora. We shall find a unity of type between the lion, the tiger and the cat, and yet how different! This unity is fainter between the hyæna and ichneumon, or between the civet cat and the weasel, or the latter and the badger or the bear. But where are the transitional forms,—the evidences of

that change, which must have occurred between these families during the immensity of time they were being modified into different species from one form? Mr. Darwin says they have become extinct in the "struggle for existence." Where again, we ask, are the evidences of this—where their remains? He answers, I cannot say; they are lost in the "imperfection of the geological record!"

Well satisfied with this explanation, Mr. Darwin proceeds to answer another objection equally grave. "In the intermediate region, having intermediate conditions of life, why do we not now find closely-linking intermediate varieties?"—(Page 174.)

Mr. Darwin gives up the attempted explanation, by the supposition of our continents having been islands in geological time, and thus centres of distinct species, "without the possibility of intermediate varieties existing in the intermediate zones."

But I confess that I think the explanation upon which he relies is infinitely less defensible.

It is given in language somewhat confused and unintelligible, but is in substance; that species exist now in a wide area, that they become somewhat abruptly rarer and rarer on the confines, and finally disappear. Hence there is a narrow neutral territory between two representative species. This view is supported by the authority of Alph de Candolle and Edward Forbes. Mr. D. considers that this is not due to physical causes alone, but that as one animal lives upon

another, there will be a tendency to diminution, or even extinction. Therefore the range of species will tend also to be sharply defined, and they will become in the neutral territory rarer and rarer, and so transitional varieties are lost.

But in order to uphold this view, Mr. Darwin is obliged to have recourse to a deduction inconsistent with his theory. He says that his species are already defined objects, (however they may have become so,) not *blending one into another by insensible gradations*. This appears to me nothing more or less than a surrender of his doctrine *in toto*, and an adoption of that of the author of the "Vestiges." It is the forms between the primogenitor and its transmuted descendant that we want as proof of Mr. Darwin's theory, and these he cannot produce, and consequently he places himself out of court.

The next difficulty which Mr. Darwin deals with is—

2.—*On the origin and transitions of organic beings with peculiar habits and structure*. This leads to an answer of the very obvious question, How could a "land carnivorous animal have been converted into one with aquatic habits; for how could the animal in its transitional state have subsisted?"—(Page 179.)

Mr. Darwin answers this boldly, by stating that "within the same group carnivorous animals exist, having every intermediate grade between truly aquatic and strictly terrestrial habits." He instances the *Mustela vison* of North America,

which, though a polecat in form, has webbed feet; diving during summer for fish, and living in the winter like other polecats. He also cites the family of squirrels, which shew a gradual development of wide posterior bodies and full skins on their flanks, up to the flying squirrel, and also the flying lemur, in which, however, there are no links connecting it with the other *Lemuridæ*. These, Mr. Darwin considers, have been lost, but he can see no difficulty in imagining how "the membrane connected fingers and fore-arm of the *Galeopithecus* might be greatly lengthened by natural selection; and this, as far as the organs of flight are concerned, would convert it into a bat."

In these surmises there is one thing which must strike the reader as remarkable. Mr. Darwin admits that his "natural selection" can only act for the good of the individual. It must, in other words, be an advance in organization, so as to give the changed species a superiority in the "struggle for existence" with its weaker and less fortunate brethren. But it will be remarked that Mr. Darwin's instances of supposed transmutation have a downward tendency in the scale of organization.

What a difference is there in the position of the polecat and the fish! Yet, because Providence has thought right to give the former means of getting its food in water, when it was scarce on land, Mr. Darwin thinks this may illustrate the transition between the mammal and

the fish—a creature much below it in the scale, and from which change it would be impossible to conceive anything that could be gained for the benefit of the mammal! So with the squirrels. Of course the nearer this animal approaches the flying squirrel, the more it assumes the structure of the bird—a creature much lower down in the scale than itself! Mr. D. thinks that this might be rendered necessary by the change of climate and vegetation, introducing other competing rodents, and thus driving a squirrel into the "necessity" of having, in "myriads of years," a pair of wings to enable it to escape from its enemies. This reasoning sounds so much like downright nonsense, that I must quote Mr. D.'s own words.—

"But it does not follow from this fact that the structure of each squirrel is the best, that it is possible to conceive under all natural conditions. Let the climate and vegetation change, and let other competing rodents, or new beasts of prey, immigrate, or old ones become modified, and all analogy would lead us to believe that some at least of the squirrels would decrease in numbers, or become exterminated, unless they also became modified in structure in a corresponding manner."—(Pages 180-1.)

In the same way the so-called flying lemur might, according to Mr. Darwin, be converted into a bat, an animal which is lower down in the scale; and of what benefit could this be to the flying lemur? Its present power of gliding

is quite sufficient to protect it from its enemies; and mark! there is no act of flying, properly so-called, performed by either the flying lemur, the flying squirrel, or the flying fish. The function is that of gliding through the air, which is done in the fish by the aid of a developed pectoral fin; in the lemur and squirrel by means of a membrane between the fore legs and hind ones, by which they can glide through the air, and thus protected by design, escape from their enemies. But the organs by which these gliding motions are performed, are not even homologous with the wings of the bird, and therefore not even framed on the same type! Yet with this knowledge Mr. Darwin argues, at page 182, that "it is conceivable that flying fish, which now glide through the air, slightly turning by the aid of their fluttering fins, might have been modified into perfectly-winged animals." Unfortunately for Mr. Darwin, man is a *reasoning* animal, and his reason depends on his power of comparison. Therefore, if he does not give us a wing with which to compare his membrane in the fish or squirrel, we cannot come to the same conclusion as he does, that his fish could ever be converted into a bird, much less into the more highly organized bat, with its warm blood, lungs, four-partite heart, and viviparous re-production, all of which changes must have been going on at the same time as that in the fin! The fact is, the flying fish, squirrel, opposum, or lemur, never strike the air with their membranous expansions. These

are merely adaptive organs, quite different from wings, and therefore the *Galeopithecus*, or flying lemur, has by all modern classifiers been separated from the bats, and placed with the lemurs.

CHAPTER VIII.

DIVERSIFIED habit next engages Mr. Darwin's attention. He expresses his opinion in the following extraordinary passage:—"But it is difficult to tell, and immaterial for us, whether *habits generally change first, and structure afterwards;* or whether slight modifications of structure lead to changed habits; both probably often change almost simultaneously."—(Page 183.)

In what Mr. Darwin calls "diversified and changed habits," he is singularly unfortunate. A British insect is made to feed upon exotic plants—nothing certainly wonderful, considering the general similarity of all vegetable tissues; a tyrant flycatcher hovers like a kestrel at one time, and at another dives like a kingfisher.

Nuttall gives a very different explanation of this diving:—"Occasionally he (the tyrant flycatcher) is seen hovering over the field with beating wing, almost like a hawk, surveying the ground for grasshoppers, which are a favourite diet. At other times they may be observed in small companies, flickering over still waters in the same employment—the gratification of appetite. Now and then, during the heat of summer, they are *seen to dip and bathe* in the watery mirror, and with this washing, drying, and pluming, they appear to be both gratified and amused."—(Manual, vol. i., p. 269.)

Our old friend *Parus major*, or large tomtit, is accused of killing birds,—a statement which, with all deference, I beg to say I do not believe. That he will crack a yew-seed, or a haw-stone, I know full well, because I have often seen him. But what of that? He knows there is a kernel inside, and that cracking it by repeated knocks with his beak, which was given him for the purpose, will open it and secure the prize!

But the next illustration of diversified action nearly took away my breath. In North America bears are sometimes seen swimming on the surface of the water *with their mouths open* catching insects. Ergo! says Mr. Darwin, "if there were always plenty of insects, I can see no difficulty in a race of bears being rendered by natural selection more and more aquatic in their structure and habits, with larger and larger mouths, till a creature was produced as monstrous as a whale!"

This certainly beats any whale story I ever heard.

The next instance of diversified habit which Mr. D. thinks favours his view, is that of North American woodpeckers, which feed on fruit, others which chase insects, and one which is found on the plains of La Plata, where no tree grows, and of course it never climbs one. Mr. Darwin does not mention the species, nor whether its feet were like those of other woodpeckers. Our common green woodpecker, which is formed like the rest of its family, with peculiar feet for climbing trees, and a long tongue, which it in-

sorts into holes and chinks for the larvæ of insects, may, nevertheless, be frequently seen feeding on the ground. Why should not a woodpecker in America wander away from the forests, and do likewise? Then again we are told that there are upland geese, with webbed feet, that rarely or never go near water. Now the word 'rarely' is a saving clause, and may be said equally of our domestic geese, which are seen feeding on some common from morning to night, and as rarely going into water.

If civilization takes away our swamps without destroying our water-hens or land-rails, why should not the former abide by the rivers and ponds, and the latter seek drains and ditches as a substitute? According to Mr. Darwin's theory, the character of the wading legs in those birds ought to be altering.—Is it so? Certainly not! Mr. Darwin says that nobody but Audubon has ever seen the frigate-bird, a partially web-footed bird, alight on the surface of the water. But Nuttall, an equally good observer, says they frequently *skim* the surface of the sea, or plunge into it after fish, in both of which operations, there can be no doubt, their webs are of the greatest use, and the exceptional case mentioned by Audubon, proves that they do sometimes, though rarely, alight on its surface. Their destiny is not, however, either swimming or diving, and many birds have their toes more or less connected with membrane, as the goshawk, which the frigate-bird may be considered to represent among aquatic birds.

The next heading of Mr. Darwin, on the "Difficulties on Theory," is—

3.—*Organs of extreme perfection and complication.* The eye naturally comes under notice first, for, as Mr. Darwin candidly observes, to suppose that it could be formed "by natural selection, appears absurd in the highest degree."

He does not, however, flinch from a bold effort to solve the difficulty, for he says further on, under the inspiration of the natural selection doctrine, that the difficulty, though "insuperable by our imagination, can hardly be considered real;" and it is illustrated by the following statement:—"How a nerve comes to be sensitive to light, hardly concerns us more than how life itself first originated; but I may remark that several facts make me *suspect that any sensitive nerve may be rendered sensitive to light, and likewise to those coarser vibrations of the air, which produce sound.*"

But what does Mr. Darwin mean by light? there is all the difference in the world between the objective light of the physicist and the subjective light of the physiologist. The latter, which is the *consciousness* of the former, is what concerns us more especially in dealing with the eye. If the retina were spread out on the face, a sheet of light might be perceived, but no objects. But suppose an arrangement of lenses, so arranged as to converge these rays to a point, and all the pencils of a body to corresponding points, we have a picture of the object on that point, from which

impressions proceed to the brain, and there produce consciousness. What, therefore, has the fact, (if shewn to be true,) of a sensitive nerve being made sensitive to light to do with the organ of vision? The eye-ball is an optical instrument, as well as a light-seeing organ; and the whole mechanism is so beautiful, that one almost trembles with delight in recognizing there the unmistakable evidence of Creative Wisdom and Design.

That retina, of which every one must have heard something, what is it? Let the general reader imagine a vast collection of structures, each in itself complete, and only capable of receiving a single pencil of light after it has passed through a series of lenses. These structures or areæ, as they have been described by Professor Goodsir, from the recollection of whose invaluable oral instructions I am now quoting, are each separately formed of 1st., what is called the limiting or most internal membrane; 2nd., fibres of optic nerve; 3rd., layers of poly-clonic nerve-cells; 4th., an internal granular layer; 5th., an external granular layer; 6th., a beautiful rod and cone, forming part of what is termed Jacob's membrane. Now of areæ so formed, the retina contains a number beyond all calculation, each being acted upon by a single ray. All the operations of vision are mechanically produced by this wonderful apparatus when the ray reaches the optic nerve, except one, and that the most important, namely, consciousness. The optic nerve conveys the optical operations to the brain, and there produces—in fact, vision.

Now this is the apparatus by which sight is produced, in forms differing according to the condition of the being in the scale of animated existence, in all to whom the faculty is given. But the apparatus and the amount of sight vary strictly according to the position of the animal in the scale of life. And this variation is so great, and in each case so admirably adapted to the peculiar conditions of life, in which the animal exists, that I consider it an insuperable answer to Mr. Darwin's theory; and such is evidently Mr. D.'s own opinion, though anxious to throw the difficulty on imagination rather than on fact. Now then for one or two facts.

Mr. Darwin says, "Among existing vertebrata we find but a small amount of gradation in the structure of the eye, and from fossil species we can learn nothing on this subject."

I can hardly believe that this passage was penned with a knowledge of what two such high authorities as Owen and Buckland have written upon the subject. But it is certainly a familiar fact to geologists that the condition of the eye of the Trilobite is well shewn in its fossil condition; and in spite of Mr. Darwin's assumption of a pre-silurian world, I must take the liberty of considering the Trilobite one of the first of created things.

"In the class crustacea," says Professor Owen, "we find a most extensive and interesting series of gradations leading from the sessile median eye speck *to two distinct eyes, provided with all*

the essential optical apparatus, and placed upon moveable peduncles. Ocelli or stomata are combined with compound eyes in the same species in certain Entomostracans, as apus and limulus. A transparent speck of the integument forms the cornea of the ocellus, immediately behind which there is a spherical crystalline body in contact with a gelatinous or vitreous humour, upon which the extremity of the optic nerve expands; a layer of dark pigmentum covers all these parts, with the exception of the cornea."....."In the Trilobites the cornea presents *the same sub-divided surface as in the limulus;* and the position of the *two eyes agrees with that of the corresponding compound pair in the large existing* Entomostracan. In the *Asaphas caudatus*, (a Trilobite,) the cornea is divided into at least four hundred compartments, each supporting a circular prominence; its general form is that of the frustum of a cone incomplete towards the middle of the head, but commanding so much of the horizon in other directions, that where *the distinct vision of one eye ceases, that of the other begins.*"—(Lectures on the Invertebrata, p. 174-5. 1843.)

Professor Owen, after finishing his description, then quotes from Dr. Buckland, the following striking and convincing remarks:—

The eyes of the Trilobites of the transition rocks, and those of their nearest congeners, the fossil limuli, from the carboniferous series, "give information," says Dr. Buckland, "regarding the condition of the ancient sea and ancient atmos-

phere, and the relations of both these media to light, at the remote period when the earliest marine animals were furnished with instruments of vision, in which the minute optical adaptations were the same that impart the perception of light to crustaceans, now living at the bottom of the sea.

With respect to the waters wherein the Trilobites maintained their existence throughout the entire period of the transition formation, we conclude that they could not have been that imaginary turbid and chaotic fluid, from the precipitates of which some geologists have supposed the materials of the surface of the earth to be derived; because the structure of the eyes of these animals is such, that any kind of fluid, in which they could have been settled at the bottom, must have been pure and transparent enough to allow the passage of light to organs of vision, the nature of which is so fully disclosed by the state of perfection in which they are preserved. With regard to the atmosphere, also, we infer that had it differed materially from its actual condition, it might have so far affected the rays of light, that a corresponding difference from the eyes of existing crustaceans, would have been found in the organs on which the impressions of such rays were then received.

Regarding light itself, also, we learn from the resemblance of these most ancient organizations to existing eyes, that the mutual relations of light to the eye, and of the eye to light, were

the same at the time when crustaceans, endowed with the faculty of vision, were first placed at the bottom of the primeval seas, as at the present moment.

Thus we find among the earliest organic remains an optical instrument of most curious construction, adapted to produce vision of a peculiar kind, in the then existing representatives of one great class in the articulated division of the animal kingdom. We do not find this instrument passing onwards, as it were, through a series of experimental changes from more simple into more complex forms; it was created at the very first, in the fulness of perfect adaptation to the uses and condition of the class of creatures to which this kind of eye has ever been, and is still, appropriate."

Mr. Darwin tells us, "from fossil species we can learn nothing." Two of the most distinguished palæontologists and comparative anatomists of the present age tell us that the highest known animal in the oldest geological stratum, in the dawn, in fact, of Creation, *possessed an eye precisely similar in every respect to animals of the same class living in our seas.* Not in a class which has become nearly extinct by the "struggle for existence," but one which out-numbers by myriads every animal living out of water put together! If "natural selection" has modified the eye of the crustacean into one of a higher grade, surely, according to Mr. Darwin's theory, the less favoured original species ought to be disappearing from the

waters of the earth! Is it so? On the contrary, though exposed to a "struggle for existence" of a most devastating kind, forming, as they do, the natural food of thousands of stronger and superior forms to themselves, there they exist more numerous than ever, and live and die as they did millions of years ago! Why, if we had asked about the transitional forms, "Oh!" would have been Mr. Darwin's answer, "they, the weakest, have gone to the wall, and become extinct." Your evidence?—"*That* is lost in the imperfection of the geological record!"

No, it is a mistake to talk about the degraded condition of an organ, or to consider "an optic nerve merely coated with pigment, and without any other mechanism" as a transitional condition, which it must be if Mr. Darwin's theory is true. Every eye, from the black speck on the Polygastric animalcule up to the eye of man, is *perfect in itself;* and nothing can illustrate better what seems so difficult for Mr. Darwin to understand by special creation, why organs as well as beings should have been formed on the same type, than a glance at the various forms of eye which are adapted to the different species of the animal. They are on the same type, because the same object is obtained in each by the same means. An animal lives in water, and its eye is formed to allow for the refraction of light. Another animal living in water has a limited range of existence, and its light is limited accordingly. In birds the sight is more acute and distinct than even

in quadrupeds. Nuttall states that a sparrow-hawk will see a lark at twenty times the distance that such an object could be seen by man. A kite will descend from a height beyond our range of vision, straight down upon a lizard, field-mouse, or bird; and with this prodigious range of vision the bird can make its eye assume the precise form suited to light and distance, the organ thus answering the purpose of a self-adjusting telescope, with a shade for examining the most luminous and dazzling objects; and hence the eagle is often seen to ascend to the higher regions of the atmosphere, gazing on the unclouded sun as on an ordinary and familiar object."—(Man. Introd., p. 5.)

If again, as Nuttall points out, nature had left them as short-sighted as we are, giving them at the same time the great agility and strength which they possess, their latent powers would have availed them nothing. "We may then in general consider the celerity with which an animal moves, as a just indication of the perfection of its vision."

And what do we really see? Why not that the more perfectly organized quadruped—the strong in the struggle for existence has the most perfect eye—but the bird, whose necessities require a more exquisite and lengthened vision, has that organ given it by the Creator in the form best adapted to its existence! And are we to believe that this is done by special creation, or by the operation of an unknown law, acting we know

not how, now by one means, now by another, here by chance, there by brute force? a law, which is not even constant in its operation, formed upon a doctrine without a shadow of probability in its favour, unsupported by proof, and not even recommending itself to the mind by the plausibility it might, if true, have derived from comparative anatomy, the known laws of physiology, or the records of geology.

Mr. Darwin says, "If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous successive slight modifications, my theory would absolutely break down."

This is an unfair way of putting the question, because to the Creator nothing is impossible. You may take the speck on the eye of the Polygastric animalcule, and add to and modify it as you will, but no human mind could convert it, even in imagination, into the human or eagle's eye—the hand of Him who first formed could alone fashion it again.

Take the eye of an insect, which is, according to the size of the creature, larger and more complicated than that of any other animal. Look at the dragon-fly, with its twenty-four thousand eyes, all beautifully arranged in the two convex masses every one is familiar with. Is not this a distinct and perfect organization, permitting the insect to fly backwards and forwards at will, and to seize upon its prey like a hawk? How by any stretch of imagination could this be con-

verted into the eye of the bird or the quadruped?

Look again at the hexagonal corneules into which the transparent covering of the compound eyes is divided;—in the ant we see fifty, in the house-fly four thousand, in the butterfly seventeen thousand, in the mordella beetle twenty-five thousand!—(Owen.) In each of these divisions there is a separate lens, and to each there is sent a twig of the optic nerve, "at once separating and connecting together the component ocelli of the compound eye."

Now how is this beautiful organ produced by "natural selection?" It is *only given to the perfect insect which lives a few hours, days, or weeks.* The caterpillar from which the insect was developed, has but a single, simple eye, because its life is for the most part stationary on a leaf or branch, and it requires no more sight than this single eye gives it. But the perfect insect has to fly with rapidity, and it is necessary that it should see distant objects, and it is therefore provided with a compound eye! Apterous, or wingless insects, are positively blind, "as the Claviger; and the blindness is often peculiar to the female sex, as in the glow-worm and cochineal insect!"—(Owen.)

Let us now look for a moment at the eye as specially adapted to fishes. First there is no lachrymal gland, because there is fluid to lubricate the cornea. Mr. Darwin will say this has become extinct from disuse. The cornea is flat, and is thus less liable to injury in the rapid movements

of the fish. The diminution of the anterior chamber, and therefore of the aqueous humour, by the flatness, is compensated by a greater convexity and refractive power of the crystalline lens, and to allow for the deviation from the spherical form, and the *consequent weakening of the power to resist external pressure, the sclerotic capsule is cartilaginous or bony.*

Well may Owen exclaim, "This beautiful chain of adjustments and inter-dependencies cannot but raise the rightly-constituted mind to the contemplation of the attributes of Creative Intelligence, herein so strikingly displayed."—(Lectures, vol. ii., p. 207.)

CHAPTER IX.

THE electric organs of fishes is another stumbling block in Mr. Darwin's thorny and intricate path; but, as he has admitted that "it is impossible to conceive by what steps these wondrous organs have been produced," I accept the admission, and go on at once to—

4.—*Organs of little importance.* Under this head we have some curious speculations.

The tail of the giraffe looks, says Mr. Darwin, like an artificially-constructed fly-flapper, and naturally enough he thinks it incredible that this could "have been adapted for its present purpose by successive slight modifications, each better and better, for so trifling an object as driving away flies." But he requests us not to be too quick in our judgment, for we know that organs, now of trifling importance, may have been of great consequence to an early progenitor, and having been slowly perfected, then transmitted down to these days; "and," continues Mr. Darwin, "a well-developed tail having been formed in an aquatic animal, it might subsequently *come to be worked in for all sorts of purposes, as a fly-flapper*, an organ of prehension, or as an aid in turning, as with the dog, though the aid must be slight, for the hare, with hardly any tail, can turn quickly enough!"—(Page 196.)

I do not think I need say one word in refutation of an hypothesis, which I might simply designate profane, but I will leave the matter to the cool reflection of those who may read a statement which shocks and outrages every proper feeling, as much as it does violence to our reason and common sense.

Instead, however, of answering that which sufficiently answers itself, I will relate here a beautiful instance of adaptation, which much puzzled naturalists until they found out the reason; and I will take the liberty of suggesting to Mr. Darwin that this is a very good instance of the uncertainty of forming an opinion upon external appearances alone.

Had the following instance of apparently anomalous or abnormal structure not had its uses shewn by observing the habits of the animal in confinement, it would doubtless have gone into the list of organs undergoing modification and variation, in due time to be converted by "natural selection" into the perfectly-formed constituent of a new species.—

The aye-aye is a small lemur, not much larger than a mouse, which inhabits the island of Madagascar exclusively. It is very curiously organized, having bat-like ears, and teeth like a beaver; but the peculiarity we have now to do with is that of the second finger of the hands which is described as unlike anything but a monstrous supernumarary digit, being slender and long, half the thickness of the other fingers, and resembling

a piece of bent wire. Now this is certainly a curious combination of structure; on the whole it is most like a lemur, and seems to be just between the latter and the true monkeys—a good instance of transition one would have thought! That anomalous-looking wiry-finger gives hope of an apt illustration of the toe of the rodent being converted by modification and natural selection, into the highest class of mammals but one, the quadrumana. And in fact, if there is anything in Mr. Darwin's theory, it is by some road of this kind that our transmutation from the inferior classes of animals has been brought about. This aye-aye is a rare animal, and but few specimens have found their way to this country, and little was known of its habits. The animal is held in great veneration by the inhabitants, who have a firm belief that if they touch it they will die within the year. The Honourable Dr. Sandwith, our Colonial Secretary at the Mauritius, fortunately overcame this prejudice of the natives by an all-invincible £10 note, and the consequence has been an extremely interesting communication from this gentleman to Professor Owen, which is published in the Proceedings of the Linnean Society for July, 1859, and which quite clears up the apparent anomaly of the finger.

"Now," says Dr. Sandwith, "as he attacked every night the wood-work of his cage, which I was gradually lining with tin, I bethought myself of tying some sticks over the wood-work, so that

he might gnaw these instead. I had previously put in some large branches for him to climb upon; but the others were straight sticks to cover over the wood-work of his cage, which *alone* he attacked. It so happened that the thick sticks I now put into his cage, were bored in all directions by a large and destructive grub, called here the moutouk. Just at sun-set the aye-aye crept from under his blanket, yawned, stretched, and betook himself to his tree, where his movements are lively and graceful, though by no means so quick as those of a squirrel.

Presently he came to one of the worm-eaten branches, which he began to examine most attentively; and *bending forward his ears*, and applying his nose close to the bark, he rapidly tapped the surface *with the curious second digit*, as a woodpecker taps a tree, though with much less noise, from time to time inserting the end of the slender finger into the worm-holes, as a surgeon would a probe. At length he came to a part of the branch which evidently gave out an interesting sound, for he began to tear it with his strong teeth. He rapidly stripped off the bark, cut into the wood, and exposed the nest of a grub, which he daintily picked out of its bed with the slender tapping finger, and conveyed the luscious morsel to his mouth.

I watched these proceedings with intense interest, and was much struck with the marvellous adaptation of the creature to its habits, shewn by his acute hearing, which enables him aptly to

distinguish the different tones emitted from the wood by his gentle tapping; his evidently acute sense of smell aiding him in his search; his secure foot-steps on the slender branches, to which he firmly clung by his quadrumanous members; his strong rodent teeth enabling him to tear through the wood; and lastly, by the curious slender finger, unlike that of any other animal, and which he used alternately as a plexiметer, a probe, and a scoop.

But I was yet to learn another peculiarity. I gave him water to drink in a saucer, on which he stretched out a hand, dipped a finger into it, and drew it obliquely through his open mouth; and this he did so rapidly that the water seemed to flow into his mouth. After awhile he lapped like a cat; but his first mode of drinking appeared to me to be his way of reaching water in the deep clefts of trees."

Now can anything in nature be more beautiful as an illustration of design than this exceedingly interesting statement of Dr. Sandwith. A small creature is destined to live in a country, the trees of whose luxuriant vegetation afford food to the lemurs, one of the quadrumanous family. One member of this family, the little aye-aye, is designed more particularly to feed upon the destructive larvæ of insects which bore into the trees. And to find this food it is provided with a series of organs which are typical of families insectivorous, or gnawing, and with an intelligence to apply these organs equal to the higher mam-

media. It taps with its delicate, apparently abnormal, wire-like finger, just as a doctor taps his patient's chest—it, in fact, percusses the tree! By its acute bat-like ears it is able to hear any difference in the sound between the solid wood and the hollow gallery of the grub. Its intelligence tells it at once here is "game." It now brings into play its "rodent" teeth, and gnaws down to its quarry; then it inserts its long "abnormal" finger, it "prehends" its food and eats it.

Now, I say unhesitatingly that these several acts show a pre-determined design, and a special adaptation in the Designer to several distinct ends, for which purpose He chooses from the types of the animal form, the means which are best calculated for His purpose. According to Mr. Darwin's theory, some squirrel, "arrested in development at an early period," varied, and was born a small wreckling. Unable to get nuts like its race, it inserted one of its claws into the holes of trees after grubs. This finger consequently grew longer than the others, and the young squirrel now lived upon grubs. A race of these young grubbers were of course established, and then came a great fight for grubs. Those which heard the best got more food, and their ears grew; the duller hearing ones dying off in the struggle for existence. Madagascar being cut off from the rest of the world, the new animal became an inhabitant thereof, and continuing to vary, other lemurs were formed by "divergence."

some retaining, and some losing, their rodent character; while others, as may be seen, vary still more, and have bat-like membranes stretching between their hind and fore legs, constituting the Galeopithecus, or flying lemur, and so on.

Now all this would be very ingenious and clever. It, unfortunately, has neither proof nor probability to recommend it, inasmuch as the organs, which would be supposed to be thus transformed by the necessities of the animal, are highly complex, and as unchangeable as is gold into silver. *Hearing* and *intelligence* are not acquirable by variation. They depend upon an acoustic instrument, perfect in each animal in itself, and upon a brain, the four great types of which, as shewn by Owen, are fixed and immutable structures.

Mr. Darwin objects to the protest of naturalists, who "believe that very many structures have been created for beauty in the eyes of man, or for mere variety." This doctrine, if true, would, Mr. D. says, be absolutely fatal to his theory, but he asserts at the same time that many structures are of no direct use to their possessors! and his argument why the above would be fatal, is that the "chief part of the organization of every being is simply due to inheritance; and consequently, though each being assuredly is well fitted for its place in nature, *many structures have now no direct relation to the habits of life of each species.*" —(Page 199.)

This strangest of doctrines is supported by still stranger arguments.

"Thus we can hardly believe that webbed feet of the upland goose, or of the frigate-bird, are of special use to these birds; we cannot think that the *same bones in the arm of the monkey, in the fore-leg of the horse, in the wing of the bat, and in the flipper of the seal, are of special use to these animals!*"—(Page 200.)

Will Mr. Darwin kindly inform me first upon what grounds he calls these bones *the same*. Secondly, I should like to know if he can shew me any structure more perfect than the limbs he has alluded to, or any other means by which the functions they perform could be more perfectly or beautifully executed. If he cannot, why should not the same great plan be adopted to perform a similar function in each? No special use! Shades of Payley and Bell, why do you not rise and point to the masterly arguments which you have left in language, which for force and truth, has never been excelled! No special use in the bones of the horse's fore-leg, because they are formed on the same type as the arm of the bat, or the monkey! Why what is the use of bones? One would almost be justified in supposing that Mr. Darwin was ignorant of the use of the skeleton. Could he attach those exquisite muscles which move the arm of the monkey to anything but bone? Could he have given support, or elasticity in motion, or freedom of action, to the horse, without *every* bone in its fore-legs? Could he have attached the web of the bat's wing without bones? or could the seal have got along

in the sea without its flipper? Shew me a single bone that is useless in these structures! The very idea amounts to an absurdity, only equalled by the supposition that follows, that "the several bones in the limbs of the monkey, horse, and bat, which have been inherited from a common progenitor, were formerly of more use to that progenitor, or its progenitors, than they are now to these animals, having such widely diversified habits!" and that "we may believe that the progenitors of the seal had not a flipper, but a foot with five toes, fitted for walking or grasping!!!"

I must here again quote Professor Owen:—"In the survey which I have taken in the present course of Lectures of the genesis, succession, geographical distribution, affinities, and osteology of the mammalian class, if I have succeeded in demonstrating the perfect adaptation of each varying form to the exigencies, and habits, and well-being of the species, I have fulfilled one object which I had in view, namely, to set forth the beneficence and intelligence of the Creative Power.

If I have been able to demonstrate *a uniform plan* pervading the osteological structure of so many diversified animated beings, I must have enforced, were that necessary, as strong a conviction of the unity of the Creative Cause.

If in all the striking changes of form and proportion which have passed under review, we could discern only the results of minor modifica-

tions of the same few osseous elements, surely we must be the more strikingly impressed with the wisdom and power of that cause, which could produce so much variety, and at the same time such perfect adaptations and endowments out of means so simple.

For in what have those mechanical instruments, the hands of the ape, the hoofs of the horse, the fins of the whale, the trowels of the mole, the wings of the bat, so variously formed to obey the behests of volition in denizens of different elements —in what, I say, have they differed from the artificial instruments which *we ourselves plan with foresight and calculation* for analogous uses, save in their greater complexity, in their perfection, and in the unity and simplicity of the elements, which are modified to constitute these several locomotive organs?

Everywhere in organic nature we see the means *not only subservient to the end*, but that end accomplished by the simplest means. Hence we are compelled to regard the Great Cause of all, not like certain philosophic ancients, as a uniform and quiescent mind, as an all-pervading *anima mundi*, but as an active and anticipating intelligence."—(Classification of Mammalia, p. 62.)

The next issue opened by Mr. Darwin is one also upon which I must call upon him to plead guilty, and resign his theory.

"If it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would

annihilate my theory, for such could not have been produced through natural selection."—(Page 201.)

To a person believing such a doctrine as that of natural selection, it is very difficult to put a case, for he has so many ways of wriggling out of the difficulty, that the chances are against you. If instead of *one* organ, I prove that *all* the organs of an animal have been formed for the good of another, I may be met by the rejoinder—the terms of my proposition are not complied with. But I still contend that if the argument is good for one, it must, *à fortiori*, be good for all. Mr. Darwin must admit that there are animals in vast numbers who live upon peculiar kinds of food, and nothing else. If they had not this food they would die. The carnivora, for instance, live entirely upon the bodies of other animals, to catch which they are provided with adequate means, to eat which they are provided with a special masticatory apparatus, and to digest which their organs are peculiarly formed. Now it would be impossible to argue that it is for the good of an animal that it should be destroyed and eaten by others. Yet, according to Mr. Darwin's theory, these animals must have been altered and modified from the form of their ancestors by "natural selection." Every modification of their structure which would have given them a better means of escape, would have acted injuriously, even to the extermination of the dominant species which fed upon them. And yet it would

be necessary that these animals should have some means of eluding their enemies, and also that they should be endowed with great powers of reproduction, or else those destined to feed upon them would become exterminated.

Here Mr. Darwin's theory obviously fails, while the truth of special creation stands out with unassailable force. Let us look for a moment at our oxen, sheep, and pigs. As a rule those animals are slaughtered throughout the world, and only exceptionally die a natural death. That this is essential to the life of man, no one but a vegetarian would doubt for a moment. His teeth and digestive organs are formed for feeding upon a mixed diet, of animal and vegetable structure. Now it could not be for the good of the ox, or the sheep, or the pig, that it should be so altered from the form of its ancestor, as to become essential to the life of man, and therefore should always die a violent and often a cruel death! Had natural selection so altered the forms of these animals that they could not have been eaten by man, and therefore escaped the knife of the butcher; then man himself could not have existed, which, I think, is bringing Mr. Darwin's argument to a *reductio ad absurdam*.

But, as vegetarians may have a voice in the matter, what of those animals, and they are a vast number, included in the great order *Carnivora*,—lions, tigers, lynxes, ounces, wolves, foxes, hyænas, civets, ichneumons, weasels, bears,

badgers, etc.? The animals which these beasts live upon *must have been formed by special creation for their exclusive use.* Natural selection could not have done it according to Mr. Darwin's own shewing.

Then, again, there is the horse. According to Mr. Darwin it is a transmuted tapir. But when for the benefit of the animal, did that part of the structure of the tapir become altered by "natural selection" for the good of the horse? It gave it, say, increased swiftness, removed a proboscis-like nose, added a tail, took away from each upper jaw one molar tooth, enclosed its toes in a hoof, doubled its height, and converted its tough, thick, rhinoceros-like hide, into the soft, hairy, moveable skin of the horse. But where was the good of all this to the tapir? At present it roams about its natural forests, feeding like the wild boar, bathing in the mire like a rhinoceros; and, although it is occasionally attacked by the jaguar, it lives, no doubt, a life of average happiness, and is the father of many families. What good to the animal, then, did "natural selection" do, by converting it into a horse, which is the slave and servant of man? Doomed to a life of labour, often to cruelty, and almost always to a violent death; for whose good was the change made? Surely not for the animal, but for man. If a hackney cab-horse were to speak in a cold winter's day in London, could we not imagine that he would express a wish that he were a tapir, wild

and free in the woods of South America?

But the supposition that any particular organ should be created for the especial use of another animal is an absurdity. Such a notion is totally opposed to the plan and order of creation in which every animal is organized, to meet its own requirements, and not those of other animals. This plan, as far as we can understand it, is to adapt the organization and structure of living beings to their mode of existence; and as most animals eat, drink, breathe, walk, circulate their blood, etc., in a manner somewhat similar, so the organs given them to perform these several functions are formed upon the same plan,—the same end is produced by a similar means, and not as Mr. Darwin contends, by an accidental alteration or variation of structure adapting itself to new functions.

Although I have only gone through half Mr. Darwin's volume, I think I have touched upon all the principal elements of his theory. There are, however, some important points still to come under our notice. *Instinct* claims for Mr. Darwin a separate chapter, for he has to overcome two great difficulties,—the cell of the hive bee, and the slave-making ants. Of course he has a fling at the stereotyped difficulty—a definition of instinct. He would gladly have defined it as hereditary habit, had not the above two cases stared him in the face. Habit is too often mistaken for instinct, and it would have suited Mr. Darwin very well to have made them iden-

tical, inasmuch as habits are acquired and hereditary. Instincts are hereditary, but not acquired. Mr. D. says a young pointer which points at birds without being taught, displays an hereditary acquired instinct. I say he shews an hereditary acquired habit. And so with the greyhounds, the bulldogs, the tumblers, which he presses into his service. Hunting hares is not an instinct,—courage in a bulldog, and tumbling in pigeons are not instincts, they are acquired habits; so the fear of young pheasants for dogs is an acquired habit, which would be lost under domestication. But the building of its nest by the bird, or its house by the beaver, are purely instinctive, and not to be acquired.

Mr. Darwin says that the act of the cuckoo in laying its eggs in another bird's nest is "instinct," (page 176,) which might have been acquired from the "habit" of one of its progenitors, of laying now and then an egg in another bird's nest; that the young so reared would inherit the habit, and so we should have produced, by "natural selection" the "instinct" of the European cuckoo! I merely remark that habits and instincts, being totally different, are not convertible. What is the operation of feeding the cuckoo's young by the foster parent? Surely instinctive? You could never convert it into a habit. Why does a cuckoo which never saw a nest, lay its egg in a nest? Surely from instinct. Why in the nest of another bird? Mr. Darwin says from an "instinct" acquired from a "habit,"

which is altogether opposed to the evident and clear distinction between the two mental operations.

Mr. Darwin gives a most interesting account of his own observations upon the "slave-making instinct" of ants, for which I must refer to the book. His observations were principally confined to two species, *Formica sanguinea* and *rufescens*. The latter are entirely dependant on their slaves. The former possess few slaves, and the masters determine the migrations, and carry the slaves. Mr. Darwin conceives that this may have originated in the habit of ants, not slave-makers, carrying off the pupæ of other species. If the progeny of these pupæ, not eaten, should turn out useful, if it were more advantageous to capture than to procreate species, then Mr. Darwin thinks natural selection might turn the habit of stealing pupæ into that of slave-making. When this habit became an instinct, then it might be modified, so as to suit the case of *F. sanguinea* in the one case, or that of *F. rufescens* in the other extreme.

As I do not believe in Mr. Darwin's theory, I do not see the difficulty which, as he says, this case of slave-making throws in his way. I am content to believe that the economy of the ant is fixed by the same unerring wisdom that caused it to exist, and Mr. Darwin's explanation of slave-making neither tells for or against the view I hold.

With regard to the cell-making of the bee,

Mr. Darwin attempts to upset the fact of the original hexagonal form of the cell, according to the modern doctrine that the cell becomes hexagonal by pressure; a case which is, in my opinion, so far from being made out, that I think every argument, particularly the observation of Mr. Smith, that single cells are sometimes hexagonal, is against such a mode of explanation.

Neuter insects is another difficulty which Mr. Darwin says he at first thought insuperable, and "actually fatal to my whole theory." The working neuter ant, for instance, is totally different from its parents. Correlation is the agent which Mr. Darwin considers gets him out of his dilemma, for he can see no real difficulty in any character having become correlated with the sterile condition of certain members of insect communities. But the real difficulty, he says, is to understand how such correlated modifications could have been slowly accumulated by natural selection. This is got over by assuming that natural selection may be applied to the *family*, as well as to the *individual*. Thus, because it might have been found that a sterile condition of certain members of the community has been advantageous to the community,—ergo, the fertile members of that *community* flourished, and transmitted to their fertile offspring, a tendency to produce sterile members!

But the climax of Mr. Darwin's difficulties arises when he finds among the neuters of different

ants, individuals differing not only from the fertile ones, but from *themselves*, and that in a remarkable degree, and that they do not graduate into each other, but are well-defined. Some carry shields on their heads, others have differently-developed jaws; one caste never leaves the nest, being fed by the workers of another caste!

All these difficulties Mr. Darwin gets over by a series of assumptions. He supposes, beginning at the separation of the neuter from the fertile species, that the variation did not all come in the neuter at the same time, but only in a few. Thus they would appear as he finds them with a gradation of form, which is the fact, according to his researches; and he ultimately comes to the conclusion that "natural selection, by acting on the fertile parents, could form a species which should regularly produce neuters, either all of large size, with one form of jaw, or all of small size, with jaws having a widely different structure; or, lastly, and this is our climax of difficulty, one set of workers of one size and structure, and simultaneously another set of workers of a different size and structure —a graduated series having been first formed, as in the case of the driver ant; and then the extreme forms, from being the most useful to the community, having been produced in greater and greater numbers, through the natural selection of the parents which generated them; until none with an intermediate structure were produced."—(Page 241.)

Having thus, as he conceives, made out his case, Mr. Darwin indulges in the following strain of triumph:—"The case is also very interesting, as it *proves* that with animals, as with plants, any amount of modification in structure can be effected by the accumulation of numerous slight, and, as we must call them, ACCIDENTAL VARIATIONS, which are in any manner profitable, without exercise or habit having come into play."

It appears to me that Mr. Darwin has misinterpreted the fact that the castes of slaves, in the driver ant from North America are very different from, and yet insensibly grade into each other. He draws from this the singular inference in the last quotation but one. But the question is simply, are these different forms produced as such by the ant, or are they modified by food, and other treatment, just as the suspended fecundity of the worker bee is re-established by feeding the larva with royal bread. It would be altogether contrary to every known fact in reproduction, to suppose that these varieties could be formed in any other way. In fact it may be laid down as an impossibility that any animal should produce a series of young which should differ as the castes of these slaves are said to do. Therefore the operation is one purely of instinct on the part of the worker ants, and Mr. Darwin's hypothesis falls to the ground.

The singular light which has of late years been thrown upon the law of reproduction, by the facts of what is termed Parthenogenesis, may help to

explain much of what appears difficult in these slave ants. But we want to know a great deal more about the economy of the Hymenoptera. One day we are told by Siebold, that the queen bee can produce eggs which will become drones without sexual intercourse. The next we are told by Mr. Stone, in the "Zoologist," that the so-called neuter bees do lay fertile eggs. We cannot draw conclusions of high scientific import from a class, which, though the most interesting, is not it appears, even in the present day, thoroughly understood. Von Siebold's observations have never been confirmed, and it is not difficult to imagine there may be here a source of fallacy.

Nothing I think can better illustrate the extreme degree of infatuation with which Mr. Darwin has become imbued with his "natural selection" theory, than when he states it was necessary for him to comprehend why the thrush in South America lined its nest with mud, as ours does, or why the male wrens of North America should build "cock nests" to roost in, like the "kitty wren" of our own school-days in England!

But why, I may ask, is the song thrush the only one of the family that lines its nest with mud? The missel thrush, the fieldfare, the blackbird, ring ouzel, and the redwing, all what Mr. Darwin would call varieties of the same species, do use mud in the construction of their nest, but *not* in its lining; while the golden oriole and dipper do not use it at all. Surely the building of a nest by a bird is purely instinctive. It

would be the height of absurdity to suppose that an "acquired habit" could make the goldfinch, the fan-tail warbler, the long-tailed tit, or any other bird in fact, construct a nest in every particular the same as the species has done since the creation, from other power than that of a beautifully-adapted instinct. And so clearly the song thrush of the old world and the new, though belonging to a fauna essentially distinct, have been created, and endowed, with the same instinct, although it would be as absurd in us to assume a knowledge of the reason, as it would be to explain why the goldfinch and the redpole should build nests so totally different. Each member of the thrush family, as well as that of every other bird, forms its nest from the power of an instinct it cannot resist, just as the caged nightingale obeys the inherited instinct of migration, by flying about its cage all night. But the most admirable part of the nest-building of birds, is their constant uniformity. They are always made alike. If the birds were insensibly being modified by natural selection, their nests ought to be changing also, to meet their anticipated new condition.

Is there no foresight in natural selection? If not, what on earth is the power or force which changes the body, but leaves the instincts untouched? If there is foresight, why then should we not see some evidence of it in the operations of the changing instinct?

Mr. Darwin considers that the larvæ of ichneu-

monidæ feeding within the live body of caterpillars, is not an instance of created instinct, but a consequence of one general law leading to the advancement of all organic beings, and to the dreadful, unnatural, and untrue result, "Multiply, vary, let the strongest live, and the weakest die."

Did the man that could express such an idea as this ever see "the storm tempered to the shorn lamb?" Did he ever look at a drop of water, and see there myriads upon myriads of simple monads, whose only existence can be shewn by the highest powers of the microscope, as minute, hardly visible specks; but living there in manifest enjoyment, though surrounded by thousands of other "stronger forms than themselves?"

Did he ever see the gentle ephemera emerge from its chrysalis, spread its gossamer wings to the sun, live its allotted half-hour upon earth, and then die?

Did he ever see the brilliant beetle, all decked in green and gold, opening its wing-cases in the summer sun, but the moment a footstep was heard, falling to the ground, to all appearances then only a small mass of the clod on which it laid?

Did he ever look at the wonderful structure of even the least, and most perishable of living things, and see there the Hand which gives to one a shell, to another a coat of mail, to another a sting, and to another the colour of the tree, or the rock, or the heather, on which it lived.

Did he ever contemplate nature, and the protection thrown by its Maker upon the smallest

thing that lives, and then enunciate the dreadful canon of "natural selection," which says, "let the strongest live and the weakest die."

Did he ever in fact contemplate nature as the work of Him, without whose knowledge "not a sparrow falleth to the ground!" who has made everything with a beauty and perfection no finite mind can comprehend, but who has shewn in all living things, whether man, with his complex organization, or the blade of grass, which springs up in the field, or the flower that grows upon the rock,—a perfect adaptation of structure to circumstances of life, which to all time will proclaim in a voice, that no bungling speculator can ever drown, "Oh Lord, how manifold are Thy works: in wisdom Thou hast made them all!"

With regard to the larva of the ichneumon living upon the body of the caterpillar, no better instance of Creative Design could be adduced. Many of my readers may perhaps have never seen or read this history, and I will therefore detail it as observed frequently by my friend Dr. Maclean.—

The insect *Sphex sabulosus* is one of those large ichneumon flies, with long pointed bodies and gaily coloured wings, which may be seen running about the leaves of plants and trees in the hot summer. The members of the family generally do this for the purpose of finding a caterpillar, into which they insert their ovipositor, and deposit an egg: the whole process is done in an instant, and the unhappy caterpillar shews at first

signs of pain, but quickly recovers, and feeds as usual. The egg deposited with unerring instinct, in due time produces a larva, which feeds upon that part of the caterpillar not immediately necessary to its life. When the ichneumon larva is full-fed, the caterpillar forms its pupa, but the resulting fly is an ichneumon, not a moth. The species, however, under consideration, the *Sphex sabulosus*, adopts a different method, and one still more characteristic of the peculiar instinct of the *species*. It first digs a hole in a dry bank a day before, or sometimes on the same day, on which it requires it. It then lays a stone, and two or three clods of earth, over the hole, and starts off for a caterpillar, which it has previously rendered insensible, but not killed. It will carry this caterpillar ten or even twenty yards. Taking hold of it by one end, half the caterpillar will project in front of the *Sphex's* head, and the other is pressed against its body, and so held as to allow the use of the insect's legs. When it arrives at the hole it will quietly lay down its burden, and remove the stone and clods of earth. It then drags the caterpillar into it, going in first itself, and then it deposits in its side—not an egg, but a larva with a barbed mouth, which is plunged into the flesh of the caterpillar, and of course, from the nature of the barb, the mouth cannot be withdrawn. The *Sphex* now fills up the hole with small particles of earth, generally placing a small stone or part of an oyster shell over the top. The parasite thus left

in the body of the caterpillar, now feeds upon its juices, and the latter lives long enough to give nourishment to its murderer, until it is full grown. It then dies, and the parasite becomes a pupa, from which the perfect-winged *Sphex* emerges the following spring.

Now the whole of these facts, noticed by a good and practised observer like Dr. Maclean, may be fully relied upon. Mr. Darwin would say this is not an instance of created instinct, but a consequence of a general law leading to the advancement of all organic beings, which law he exemplifies in the words, "Multiply, vary, let the strongest live, and the weakest perish."

But I ask, why does the *Sphex* dig a hole? Why is it endowed with the power of paralyzing the caterpillar? Why does it drag it to the hole, and then deposit within it its larva? Surely if these operations are not instinctive, there is no meaning in the word. Every step in the process is done with methodical precision, and with an evident foresight which can result from nothing but a faculty given to the insect by its Maker, for the purpose of perpetuating its species, and destroying a creature which was feeding upon vegetable productions necessary for the use of man, or some other animal. The *Sphex* never sees its progeny; it cannot, therefore, be the result of a habit inherited, for this would imply a knowledge, which it is clear the insect never had, and never could have. It can only be explained as an act of creative design.

While on the subject of insects, I will detail some interesting points in the economy of two of our most beautiful butterflies, namely, the *White Admiral*, and the *Purple Emperor*. For these particulars, not hitherto published, I am also indebted to my friend Dr. Maclean, who has been a close and accurate observer of the habits of insects, and who has not only shewn me most of what follows, but has kindly allowed me to make use of his notes. In the whole field of nature there is nothing more beautiful or exciting to an entomologist than a sight of these two magnificent butterflies, gliding along the rides of a wood, or over the tops of the highest oak trees, in a hot summer's day. They are closely allied in form and habit, so much so, as to have been classed by many naturalists in the same family; but they differ essentially in their economy and larvæ.

The white admiral, *(Limenitis sibylla,)* deposits its egg, (which is in shape something like a modern sea-urchin, and covered with angular plates,) in the month of July, on the upper surface of the leaves of the common honey-suckle, in the thick high-slop of the woods; only one egg on each leaf. In about a fortnight the eggs hatch, and the young caterpillar commences life on its own account. It invariably crawls to the distal end of the leaf, and very carefully avoids the midrib, feeding upon the soft portions on each side. Now every botanist knows that the honey-suckle is deciduous, and casts off its leaves in

autumn. Our young caterpillar, without any instruction from its mother, who dies before it is born, knows all this as well as we do, for when it has eaten the leaf half way, it begins to prepare for the future. First of all knowing that the leaf will fall off, it spins a silken thread, by which it is securely attached to the stem. It now folds up the remainder of the leaf, inclosing itself in a very comfortable hammock, which, when the leaf, in the course of nature, drops off, swings to and fro, like a sailor's cot in a gale of wind. But it is very secure, for the silken cord is elastic, and not easily detached, while being of the same colour as the stem of the honey-suckle, it is very difficult to observe, and the most experienced larva-hunter will find it hard work to make it out until he is shewn it once.

If you take a glass and look at the little cot, you will probably see nothing but the said cot closed in on all sides. Try another, and you will find a little chink partly open, and there you will see with wonder and delight a small reddish-looking caterpillar, covered with spines, and coiled up into a ball. Our friend is in his winter's sleep, and is able in this condition to resist any amount of frost or snow, wind, hail, or rain; and so the dreary winter passes away.

With coming spring, however, fresh duties have to be performed. The early warm sunshine makes the bud, which the caterpillar knows as well as we do, is situated in the axil of the old leaf-

stalk, to burst forth and grow;—and the same warmth awakens the sleeper. During the months of April and May it feeds. In June it goes into a chrysalis, whence, early in July, it emerges a large and beautiful butterfly!

"Child of the sun, pursue thy rapturous flight,
Mingling with her thou lov'st in fields of light;
And where the flowers of Paradise unfold,
Quaff fragrant nectar from their cups of gold."

And other eggs are laid, and then the beautiful butterfly is seen no more on earth.

Now the whole of this year of the insect's life is a circle of pre-ordained events, each of which is essential to the existence and perpetuation in time of the creature. Cut the links of the chain, or leave one of them out, and then the whole series of events is inevitably destroyed.

Next look for a moment at the noble emperor of all the butterflies, glittering in his rich purple robe as he sails along the tops of the forest oak. What is his history? As I have not in this instance seen the changes detailed, I will quote Dr. Maclean's own words:—

"July 16th., 1834.—I saw *Apatura Iris* deposit two eggs on two upper leaves of the sallow. One, which I brought home with me, produced a small green larva on the 25th. The other, which was left in its natural situation, did not hatch till the 28th. The larvæ in the first instance are without horns, having heads similar to ordinary caterpillars, and of a dark brown colour.

Eight days after birth they change their first skin, and have now two horns, or fleshy prolongations on the head, which are, however, at this period much longer proportionally than they are afterwards. The colour is now green, *like the leaf of the sallow*. One of these larvæ died, but the other continued to feed on the same leaf upon which it was hatched, till the 15th. of November. After feeding it always returned to rest on the apex of the midrib, which was left untouched. On the above day, however, it moved to the axil of the leaf-stalk, and here it stretched itself out at full length, with its horns porrected, appearing as though it had taken up its winter quarters. Previously to this time its attitude was sphingiform, or like that of the larvæ of the puss moth. On the 18th. it moved again, and attached itself to a cloth covering a small cage, by which it was surrounded, within half an inch of the leaf-stalk, its former abode. On the 27th. the leaf exfoliated, as did also that on which the other egg had been laid. The previous night had been colder (23° F.) than any night during the autumn. The larvæ now enclosed itself in a web, but it unfortunately died during the winter."

The rest of the history however is well known, as the larvæ are found feeding on the sallow up to the middle of June, when they change into chrysalides, and emerge about the middle of July in the imago form. The egg is totally different in shape from that of *Sibylla*, and is like one of the fossil echinidæ found in the chalk, having

longitudinal lines dividing it into spaces, similar to the ambulacral plates of the echinus.

Now these histories are very suggestive in reference to Mr. Darwin's views. We have two insects very much like each other in form, structure, habit, and markings. They may indeed be adduced as species which, from their general characters, might be assumed to have a common origin. But nothing can be more opposed to such a view than their history, as detailed above, in the earlier periods of their lives. The eggs, though laid at the same time, are different altogether in shape and texture; the caterpillar produced by the one is green, horned, tapering at the end, and without the last pair of pro-legs, and it hybernates on the stem in a web. That of the other is cylindrical, spiny, reddish brown with white stripes, and it hybernates in a hammock, made out of the remains of the leaf upon which it had been feeding. What power, except that of special creation, and designing pre-ordination, can for a moment be allowed as that by which the wonderful instinctive faculties of these creatures were produced? And yet such instances of difference in habit could be adduced by hundreds of thousands among insects alone.

The cases I have selected ought to have borne some fruit for Mr. Darwin, whereas they tell against him as strongly as facts can do. If naturalists of the present day would go more into the haunts and seclusions of animal life, and study habits and instincts, instead of wasting

their time in splitting hairs, about the distinctive speciality of this or that form; or if, instead of straining resemblances into analogies, and analogies into homologies, they would study nature more in the field, and less in the closet, we should hear little said, or urged, or written, against the special creation of organized beings.

On the subject of instinct, I cannot refrain from quoting here the following passages from Professor Goodsir's admirable and highly philosophical address, delivered to the graduates in medicine, in the University of Edinburgh, for 1859. These remarks have a general significance, and a wide application to the question we are now discussing:—

"A man is distinguished from all the other organized beings, in the midst of which he is placed, by the comprehensiveness of the conditions of his economy; he is also peculiar in the mode in which he is able to provide for them. His peculiarity consists not so much in the complexity of his corporeal frame, as in the character and sphere of his consciousness. The conscious principle, if the expression may be so applied, of the horse or dog, is influenced only by external circumstances; the sphere of its activity is, so to speak, altogether external to itself, impressible from without, and therefore in some sort conscious of surrounding objects, it is altogether unconscious of itself. The so-called mental powers of the animal are capacities and faculties, excited only by corresponding external objects, or by the re-

collection of these. Not endowed, therefore, with independent powers, *its acts are acts pre-determined* for it, in the fundamental arrangement of its entire economy, with a precision and to an extent exactly commensurate with the conditions of its existence and welfare. The animal has consequently no field allotted to it for the exercise of judgment, and can, therefore, commit no error, nor be responsible for any act."

"In our human economy, on the other hand, we are not only conscious of the material objects which surround us, but we have in addition a consciousness even more vivid of our conscious principle itself. We recognise in our economy, moreover, not only certain capacities and faculties, the proper ends, operations, and scope of which are directly pre-determined and arranged, as in the lower animals, for certain requirements; but we are conscious, in addition, of beliefs, capacities, and faculties, the objects of which are indicated, and their operations conditioned and regulated by the laws of the conscious principle itself. In virtue of the endowments of this his higher principle, man is enabled to extend continuously his knowledge of the laws of external nature, and his influence over her. From the same source he derives his consciousness of the law of duty, and of that liberty of action with which it is associated: hence also, through free knowledge and moral liberty, the unassisted human reason acquires the conviction of a supreme lawgiver."—(Edin: New Phil: Journal, Oct., 1859.)

CHAPTER X.

The next chapter is devoted to the consideration of hybridism; and Mr. Darwin draws the conclusion that there is no distinction between varieties and species, because "forms known to be varieties, or sufficiently alike to be considered as varieties, and their mongrel offspring are very generally, but not quite, universally fertile." I shall content myself, in answer to this, by quoting the remarks of the greatest known authority upon the subject, M. Isidore Geoffry St. Hilaire, who, in presenting the last volume of his great work, "On the General Natural History of the Organic Kingdoms," to the Academy of Sciences, in Paris, took occasion to discuss this very subject; and after stating that he had arrived at opinions intermediate between those of Haller, Bonnet, Blumenbach, and Meckel on the one side, and of Morton on the other, finishes thus:—"The conclusion at which I have arrived is the following:—There are a great number of hybrids sterile, and also a great number imperfectly fertile. But there are others which fully partake of the power of reproduction, either with original species or among themselves. What has been called the principle of Buffon, but which was in reality that of Pliny, (for Buffon, after having admitted it, condemned it three several times as a foolish

prejudice,) must disappear from science, where it has so long been pre-eminent, constituting, as it does, with several other propositions not less contestable, what the partizans of the fixity of species consider as the classical doctrine upon hybrids. *But in throwing aside this principle, we must be very careful how we substitute for it the contrary principle; for if it is not certain that hybrids are generally or imperfectly fertile, still less can we sustain that they are generally calculated (aptes) to re-produce themselves. In reality there is not here a fixed principle, but only facts to ascertain, (constater,) and these facts are very variable according to the species which are under consideration.*"—(Revue et Magazin de Zoologie, January, 1860, p. 40.)

Now let me ask in all seriousness, if, according to this result of the labours of perhaps the greatest living authority upon the subject of hybridism, any one is justified in inferring therefrom the identity of species and variation, and from thence drawing a deduction in support of a generalization of much greater magnitude and importance?

M. I. Geoffry St. Hilaire's experiments were performed between animals of the same family as the dog and the wolf, and the dog and the jackal, and yet he cautions us, in unmistakable language, not to apply the principle to the general fertility of hybrids. Mr. Darwin, however, makes it one of the chief pillars of his doctrine, and is obliged to give it force by assuming that there

is a universal law of nature applicable to the subject. Thus we see how easily the ground is cut away from beneath his feet.

What the facts are which we are to have in the promised great work, is, of course, problematical. They cannot, however, in my opinion alter the position in which he stands, inasmuch as he has clearly put forth his strength in the book before us, and that I believe is powerless to make his case even plausible.

The ninth and tenth chapters treat of the imperfection of the geological record and geological succession. I have before alluded to these subjects, and to do them justice would require much greater space than I can command. The whole question, however, is so well put by a correspondent of Archbishop Whately, an eminent scientific man, in a letter published in the "Spectator," for March 24th., 1860, that I shall take the liberty of making an extract from it.—

"I proceed now to notice the manner in which Darwin tries to fit his principles to the facts of geology.

I will take it for granted that the known series of fossil-bearing rocks, or deposits, may be divided into the palæozoic, the mesozoic, the tertiary or neozoic, and the modern, the fens, deltas, etc., etc., with the spoils of the actual flora and fauna of the world, and with wrecks of the works of man.

To begin then with the palæozoic rocks. Surely we ought on the transmutation theory, to find

near their base great deposits with *none but the lowest forms of organic life*. I know of no such deposits. Owen contends that life began with the infusorial forms. They are at any rate well fitted for fossil preparation; but we do not find them. Neither do we find beds exclusively of hard corals and other humble organisms, which ought, on the theory, to mark a period of vast duration while the primæval monads were working up into the higher types of life. Our evidence is, no doubt, very scanty; but let not our opponents dare to say that it makes for *them*. So far as it is positive, it seems to me point-blank against them. As we ascend in the great stages of the palæozoic series, (through Cambrian, silurian, Devonian, and carboniferous rocks,) we have in each a *characteristic* fauna; we have no wavering of species—we have the noblest cephalopods and brachiopods that ever existed; and they preserve their typical forms till they disappear. And a few of the types have endured, with specific modifications, through all succeeding ages of the earth. It is during these old periods that we have some of the noblest ichthic forms that ever were created. The same may be said, I think, of the carboniferous flora. As a whole, indeed, it is lower than the living flora of our own period; but many of the old types were grander, and of higher organization than the corresponding families of the living flora; and there is no wavering, no wanting of organic definition, in the old type. We have some land reptiles

(batrachian) in the higher palæozoic periods, but not of a very low type; and the reptiles of the permian groups, (at the very top of the palæozoic rocks,) are of a high type. If all this be true, (and I think it is,) it gives but a sturdy grist for the transmutation-mill, and may soon break its cogs.

We know the complicated organic phenomena of the mesozoic (or oolitic) period. It defies the transmutationist at every step. 'Oh! but the document,' says Darwin, 'is a fragment. I will interpolate long periods to account for all the changes.' I say, in reply, if you deny my conclusion, grounded on positive evidence, I toss back your conclusions, derived from negative evidence—the inflated cushion on which you try to bolster up the defects of your hypothesis. The reptile fauna of the mesozoic period is the grandest and highest that has lived. How came they all to die off, or to degenerate? And how came the dinosaurs to disappear from the face of nature, and leave no descendants like themselves, or of a corresponding nobility? Did they tire of the land, and become whales, casting off their hind-legs! And, after they had lasted millions of years as whales, did they tire of the water, and leap out again as pachyderms? I have heard of both hypotheses; and I cannot put them in words without falling into terms of mockery. This I do affirm, that if the transmutation theory were proved true in the actual world, and we could hatch rats out of the eggs of

geese, it would still be difficult to account for the successive forms of organic life in the old world. They appear to me to give the lie to the theory at every turn of the pages of Dame Nature's old book.

And now for a few words upon Darwin's long *interpolated periods* of geological ages. He has an eternity of past time to draw upon; and I am willing to give him ample measure; only let him use it logically, and in some probable accordance with facts and phenomena.

I place the theory against facts viewed collectively. 1st.—I see no proofs of enormous *gaps* of geological time, (I say nothing of years or centuries,) in those cases where there is a sudden change in the ancient fauna and flora. I am willing, out of the stock of past time, to lavish millions or billions upon each epoch, if thereby we can gain rational results from the operation of *true causes*. But time and 'natural selection' can do nothing if there be not a *vera causa* working in them. [Note—see remark on 'Time,' in the 'Annotations on Bacon's Essays.'] I must confine myself to a few of the collective instances.

2nd.—Towards the end of the carboniferous period, there was a vast extinction of animal and vegetable life. We can, I think, account for this extinction mechanically. The old crust was broken up. The sea bottom underwent a great change. The old flora and fauna went out; a new flora and fauna appeared, in the ground now called Permian, at the base of the new red sandstone.

which overlie the carboniferous. I take the fact as it *is*, and I have no difficulty. The time in which all this was brought about *may* have been very long, even upon a geological scale of time. But where do the *intervening* and connecting types exist, which are to mark the *work of natural selection?* We do not find them. Therefore the step onwards gives no true resting-place to a baseless theory; and is, in fact, a stumbling-block in its way.

3rd.—Before we rise through the new red sandstone, we find the muschel-kalk (wanting in England, though its place on the scale is well-known,) with *an entirely new* fauna: where have we a proof of any enormous lapse of geological time to account for the change? We have no proof in the deposits themselves: the presumption they offer to our senses is of a contrary kind.

4th.—If we rise from the muschel-kalk to the lias, we find again a new fauna. All the anterior species are gone; yet the passage through the upper members of the new red sandstone to the lias is by insensible gradation, and it is no easy matter to fix the physical line of their demarcation. I think it would be a very rash assertion to affirm that a great interval took place between the formation of the upper part of the new red sandstone and the lias. Physical evidence is against it. To support a baseless theory, Darwin would require a countless lapse of ages, of which we have *no* commensurate physical monuments; and he is unable to supply any of the connecting

organic links that ought to bind together the older fauna with that of the lias.

I need hardly go on any further with these objections. But I cannot conclude without expressing my detestation of the theory, because of its unflinching materialism;—because it has deserted the inductive track, the only track that leads to physical truth;—because it utterly repudiates final causes, and thereby indicates a demoralized understanding on the part of its advocates. In some rare instances it shews a wonderful credulity. Darwin seems to believe that a white bear, by being confined to the slops floating in the polar basin, might be turned into a whale; that a lemur might easily be turned into a bat; that a three-toed tapir might be the great grandfather of a horse! or the progeny of a horse may (in America) have gone back to the tapir.

But any startling and (supposed) novel paradox, maintained very boldly, and with something of imposing plausibility, produces, in some minds, a kind of pleasing excitement, which pre-disposes them in its favour; and if they are unused to careful reflection, and averse to the labour of accurate investigation, they will be likely to conclude that what is (apparently) *original*, must be a production of original *genius*, and that anything very much opposed to prevailing notions must be a grand *discovery*,—in short, that whatever comes from 'the bottom of a well' must be the 'truth' supposed to be hidden there."

In Professor Owen's recent work on the "Fossil Mammalia," this part of the subject is handled in the same masterly manner, as the relations of living species is in that from which I have already quoted so freely. The evidence which he collects and contrasts with the greatest care, all tells in the strongest manner against Mr. Darwin's doctrine:—

"Organic remains, traced from their earliest known graves, are succeeded one series by another to the present period, and never re-appear when once lost sight of in the ascending search. As well might we expect a living ichthyosaur in the Pacific as a fossil whale in the lias, the rule governs as strongly in the retrospect as the prospect. And not only as respects the vertebrata, but the sum of the animal species at each successive geological period, *has been distinct and peculiar to such period.*"

But the extinction which we observe in the geological periods was no where sudden. Life seems to have been extinguished by a law which we cannot understand, but one totally opposed to that which would have obtained, had Mr. Darwin's theory been true. Thus, as we have seen, the geological history does not speak of the destruction of the weak by the strong. What have become of the great bat-like animal, the pterodactyle, and the huge saurians, whose images have been so well restored for us by Mr. Hawkins, at the Crystal Palace? What has become of the mammoth, or elephant, considerably larger than

either of the two species now existing? Or of the dinornis of New Zealand, a bird standing ten feet and a half high, whose bones are as large again as those of the ostrich, and whose egg was ten inches long, and seven in diameter? They are extinct,—blotted out from the face of the earth for ever. While the apteryx, the most aberrant of all birds, without either wings or tail, still lives to prove that the weakest do not always go to the wall. But the above extinct animals lived in their own time in all the luxuriance of a Provident Nature. They served the purpose for which they were created, and their remains now attest the Power that created and extinguished.

The same rule is observed in the invertebrate class. Where do we see anything now living in our seas like the ammonites, as large as cart-wheels, which are found in our oolitic strata? or the huge nautili, or ostrea? Certainly they give no evidence of the "struggle for existence," and the "natural selection" of the strongest and most dominant species.

The two chapters, eleven and twelve, upon geographical distribution, are the best examples in the book of special pleading, or the art of turning facts to suit a particular theory, assumed to be true. The distinctness of the several faunæ throughout the world, more particularly of India and Australia, and of the latter, from every other country; and the great mass of proof afforded by the living things in each quarter of the globe,

and in much more confined areas than these, would, one have supposed, have been all-sufficient to satisfy the most sceptical doubter of the truth of special creation. Not so Mr. Darwin. With the most labouring and incessant hammering, he knocks his favourite theory through every difficulty. Nothing stops him. The *ignis fatuus* which he has created, goes on dancing its flickering existence through the sloughs and marshes which have swallowed it up a hundred times before. He answers the difficulties of geographical distribution thus:—

1st.—We are to make due allowance for our ignorance of all the changes of climate and land-levels, which have occurred during the recent period. 2nd.—We are profoundly ignorant with respect to the many and curious means of occasional transport. 3rd.—A species *may* have ranged continuously over a wide area, and then have become extinct in the intermediate tracts.

When these three things are taken into account—two expressions of profound ignorance and one of excessive doubt—"the difficulties in believing that all the individuals of the same species, *wherever located*, have descended from the same parents, are not insuperable."—(Page 407.)

Then he goes a step further.—

"Make the same allowances for our ignorances, and remember that some forms of life change most slowly, enormous periods of time being thus granted for their migration, and I do not think the difficulties are insuperable, to account how

on my theory, distinct *species* of the same *genus* must have spread from one parent source."

And thus he thinks are to be explained all the leading facts of geographical distribution—migration—localization of genera—sub-genera—species—why the inhabitants of South America, in the mountains and plains, are linked together and to extinct beings—why oceanic islands should have few inhabitants—why whole groups of organisms, as batrachians and terrestrial mammals, should be absent from oceanic islands, whilst isolated islands possess their species—why the inhabitants of an archipelago should be closely related, and to those of the nearest continent—why in two areas, however distant, there should be a correlation in the presence of identical species—of varieties—of doubtful species, and of distinct but representative species.

A tolerable long list of explanations, which we are told, by reason of two categories of ignorance and a doubt, to add as support to the theory of natural selection!!

Upon the subject of geographical distribution of species, I will make one or two remarks and extracts from the works of eminent men. And first as to *Plants*.

The number of species of plants throughout the world is estimated by Meyen at two hundred thousand.

"If we now look over this immense variety of plants, we shall find that nature, *under similar conditions* of climate, has always produced similar,

often even the same forms. The naturalists, Banks and Solander, as well as the two Forsters who accompanied Cook in his voyages round the world, and Sparmann, were not a little surprised when they found, in the region of Cape Horn, a vegetation similar to that of our northern zone. If we examine the vegetation of the plains, from the extreme north to the torrid zone, we shall find, as we change the latitude, a continual change in the physiognomy of the vegetation; and if, in the torrid zone, we ascend from the level of the sea to the top of the highest mountains, which there often rise above the limit of perpetual snow, we shall find again the same order of changes more or less clearly defined. There in a short time we pass through climates corresponding to those of burning Africa, of the fair lands of the south of Europe, and of frozen Spitzbergen; and as the climate changes with the increasing elevation, so also does the vegetation. The majestic palm and the fruitful banana are not found above the height of seven or eight thousand feet; but near the limit of perpetual snow on these mountains we meet with grasses, cyperaceæ, gentianæ, and other plants similar to the forms of northern Europe."—(On the Geography of Plants, translated by Ray Society, pages 4–5.)

In commenting upon these facts, M. Meyen very justly observes that some of the *causes* of this distribution of plants are open to our observation; as, for example, when a plant from a hot country

is supplied with hot-house heat, and grows equally well in ours, we have found out why it will grow exclusively in hot countries; or if we take marsh plants from their natural situation, and plant them in our gardens, we see that they flourish only when planted where nature intended them to grow; or, again, plants which live in the shade naturally, will only grow in similar situations in our gardens. So far for the *causes;* but the laws which regulate these causes are inexplicable, as well as those by which different groups of plants predominate in different regions, or are confined within limited areas.

If I may venture to make a suggestion, however, it is, that to the effects of localization, climate, moisture, etc., we must add that of the soil. Why do monkeys only live in the region of palms? Simply because the palms are necessary for their subsistence. The Creator has specialized the distribution of the animal to the climate which produces the food upon which it lives. So with plants, which have a different character at the same altitudes, and temperature, in different parts of the world; the same relation subsists between the plant and the soil, as does between the palm and the monkey.

According to Mr. Darwin's theory, two different plants growing in the same altitudes and temperatures in different parts of the world, is a proof of the varying descendants of species by inheritance. I believe it is simply an adaptation of the thing which grows to the elements ne-

cessary for its growth—the soil, temperature, moisture, and light. Assuming the truth, also, of special centres of creation, it by no means follows that Mr. Darwin's views, as to the effect of barriers upon migration, should be the real cause of the difference between the faunæ of two countries, as South and Central America, or the western and eastern shores of the Pacific. If it were so, how are we to account for such facts as the following?—"Indeed I am inclined to believe that there are very few South American birds, except in the more widely-diffused accipitres, grallæ, and anseres, which are really to be met with in Mexico and Central America."—(Sclater, in Proceedings of Zoological Society, Part 1, 1859, page 45.) Here are no barriers, for the land is continuous between one country and another.

But this difference of species on different parts of the world, is by no means universal. Professor Asa Gray has recently pointed out, in a paper read before the American Scientific Association, on the similarity of the plants of north-eastern Asia and those of the eastern portion of North America, that, "In many cases, there is not only similarity, but even identity of species." Among instances of identity he mentions gentian, noble-bush, poison ivy, cranberry, and others, which are of the same species on both continents, and it is probable that further researches will disclose additional instances. Even where there is a difference in species, there is generally a remarkable similarity in many of the genera

on the two continents."—(Ed. New Phil. Journal, Oct., 1859, page 299.)

It is this similarity between genera and species which has induced Dr. Hooker to make extensive enquiries into the affinities of plants, the result of which is the adoption of Mr. Darwin's views, at all events in part, by that distinguished botanist.

But I think that it will be readily admitted that the analogy between plants and animals, so far as this great question of the origin of species is concerned, cannot be sustained. Plants must be subject to the continued effects of crossing, under circumstances to which the animal is not exposed. The conscious principle of the animal, and the instincts implanted in it by nature, must protect, and does protect it, from the anomalies which we see effected in the production of the cabbage, the peach, or the apple. And again, we have no proof whatever, that the animal is capable of such changes as those which I have mentioned (and many others could be adduced) in the vegetable world.

Take, for instance, the dog, or pigeon, or sheep, or ox, and look at the extreme forms of each. There is nothing in them at all approaching the difference we see between the cauliflower and the *Brassica oleracea*, or the Swedish turnip and its source, the *Brassica campestris*. Further, I may remark that the principles of diagnosis are not so well defined in plants as in animals, and that there is a much greater

similarity of parts in the former than in the latter. But I must leave this question to be settled by botanists: I merely now enter my protest against the analogy of the fed-up abnormities from the vegetable world being adduced in support of the assumed change of organic structure, which would be necessary to convert a bear into a whale, or a nightingale into a pelican.

In the paper above alluded to, by Dr. Asa Gray, there are some further illustrative remarks, which I will quote.

"Similarity of climate does not necessarily indicate similarity in the floras of two countries. The vegetation of Australia is a signal illustration of the fact, being of a very peculiar type. The distribution of plants on the earth's surface is limited by natural laws, such as the interposition of large bodies of water, of high and snowy ranges of mountains, or of rainless regions, such as those of the Pacific coast. *But the most stringent* of these laws is the law of climate, as marked out by the isothermal lines. It is because the presence of the same species in this country and in the Upper Himalaya region appears to transgress this law of climate, that the fact seems so strange.

"But we must remember that since the period of the formation of the tertiary rocks the climate of this portion of the earth has gone to two great and opposite extremes. During the fluvial period the temperature of the Arctic regions

was so mild, that the elephant, lion, buffalo, and mastodon, inhabited what is now the Arctic regions, and of course the limits of the tropical and temperate flora must have been extended in a corresponding degree in the northern direction. Again, during the previous glacial epoch the climate of the Arctic regions was extended southward over what is now the temperate zone, and the temperate climate existed in regions now tropical. Isothermal lines were the same then as now, and California had a climate like that of New England at the present day. The Alleghany and Catskill Mountains contain evidence of the presence, during the glacial period, of plants now confined to the Arctic regions. Twice, then, have the floras of the eastern portion of North America, and the eastern portion of Asia, been gradually brought together, and twice gradually separated by great climatal revolutions; and in this way a certain amount of intermingling of species has occurred."—(Op. Cit., page 300.)

Such is the simple and most probable explanation, by a distinguished botanist, of facts which Mr. Darwin attributes to inter-migration. Mr. Darwin believes that during the older pliocene period, and before the glacial, the climate of the world was warmer than it is now; that the progenitors, or a great part of them, of present species, lived in the circumpolar land; that, as the climate became less warm, they migrated southwards, both in the Old and New World, and that we now see their descendants in a

modified condition. These emigrants mingled with the inhabitants of the Old and New World, and had thus to complete the productions of two other great regions, which was of course favourable to the theory of modification with descent. Mr. Darwin says that the cases of relationship without identity, thus produced, are inexplicable on the theory of creation. It strikes me that the explanation of Dr. Asa Gray will be accepted by nine people out of ten in preference to that of Mr. Darwin.

Now with regard to the geographical distribution of animals. Suppose, as suggested by Agassiz, a traveller were to embark at Iceland, and pass through the continent of America. He would go through representatives of every climate in the world. In Greenland and Baffin's Bay the fauna will be arctic, and for the most part identical with that of the same region in Europe. When he reaches Newfoundland he will find forests succeed the wide and naked turf of the plains, and animals appropriate thereto. This would be the commencement of the temperate fauna. As he advances to New England and Nova Scotia, species gradually increase in number, until he arrives amid the rich, and astonishingly various, animals of the tropics. Going on towards the tropic of Capricorn, the contrast of the season will be more marked, *the vegetation less luxuriant*, and the animals will become fewer and less varied. He is now again in the temperate zone, and, as he approaches Cape Horn,

both fauna and flora will become more and more impoverished. Then, if he gets within the limits of the antarctic fauna, he will again find it resembling that from which he started.

Now surely cause and effect are pretty clearly shewn in this sketch, which may represent a general view of the fauna of the world. Wherever there is plenty of food, there is the greatest abundance of animal life, each creature being adapted to its position in the scale of nature, and wisely so to the circumstances of its existence.

"There is only one way," says Agassiz, "to account for the distribution of animals as we find them, namely, to suppose that they are *autochthonoi*, *that is to say, that they originated like plants*, on the soil where they are found.

In order to explain the particular distribution of many animals, we are even led to admit that they must have been created at several points of the same time; an inference which we must make from the distribution of aquatic animals, especially that of fishes. If we examine the fishes of the different rivers of the United States, peculiar species will be found in each basin, associated with others that are common to several basins. Thus, the Delaware River contains species not found in the Hudson; but on the other hand, the pickerel is found in both. Now if all animals originated at one point, and from a single stock, [as they did, according to Darwin's theory,] the pickerel must have

passed from the Delaware to the Hudson, or *vice versâ*, which it could only have done by passing along the sea-shore, or by leaping over large spaces of *terra firma*; that is to say, in both cases it would be necessary to do violence to organization. *Now such a supposition is in direct opposition* to the immutability of the laws of nature."—(Comparative Physiology, by Gould and Agassiz, edited by Dr. Wright, p. 384.)

Man himself, although the only animal that can live in all, and every region of the globe, is at the same time more or less subject to the law of limitation, as expressed above, and it is singular, as Agassiz has pointed out, that the races of mankind, more or less characterized by certain peculiarities of feature, as the Caucassian, Mongolian, and African, have their home in those parts of the earth which represent the great zoological regions; the Samoyedes in Asia, the Laplanders in Europe, and the Esquimaux in America, live amid the Arctic faunæ. In South and Central Africa we have the Hottentot and Negro, the inhabitants of Northern Africa are allied to their neighbours in Europe, while the natives of New Holland are "like its animals, the most grotesque and uncouth of all races."

Other causes have also had great influence in the distribution of animals and plants. "The form of continents, the bearing of the shores, the direction and height of mountains, the mean level of great plains, the amount of water circumscribed by land." The equalizing influence of a large

sheet of water, the temperature of which is less liable to sudden changes than the atmospheric air, is very apparent in the uniformity of coast vegetation over extensive tracts, *provided the soil be of the same nature.*

"But," continues M. Agassiz, "however powerful may be the degree of heat; be the air ever so dry or ever so moist; the light ever so moderate or ever so bright, alternating ever so suddenly with darkness, or passing gradually from one condition to another; *these agents have never been known to produce anything new, or to call into existence anything that did not exist before.* Whether acting isolated or jointly, they have never been known even to modify to any great extent the living beings already existing, unless under the guidance and influence of man, as we observe among domesticated animals and cultivated plants. This latter fact shews, indeed, that the influence of the mind over material phenomena, *is far greater than that of physical forces, and thus refers our thoughts again and again to a Supreme Intelligence, for a cause of all these phenomena, rather than to the so-called physical causes.*"—(Op. Cit., page 386.)

Now these are the sentiments of a man, who, as a naturalist, stands second to no one in existence; and I have the greatest possible pleasure in closing this part of the subject with one more extract from the same pen; the thought and language, being the result of a life spent in the study of nature, speak far more power-

fully for a First Cause, and a special Creator than anything I could adduce.

"The geographical distribution of organic beings displays more fully *the direct intervention* of a Supreme Intelligence in the plan of creation, than any other adaptation in the physical world. Generally the evidence of such an intervention is derived from the benefits, material—intellectual and moral—which man derives from nature around him, and from the mental conviction which consciousness imparts to him, that there could be no such wonderful order in the universe without an omnipotent ordainer of the whole. This evidence, however plain to the christian, will never be satisfactory to the man of science in that form. In these studies evidence must *rest upon direct observation and induction*, just as fully as mathematics claims the right to settle all questions about measurable things. There will be no scientific evidence of God's working in nature, until naturalists have shewn that the whole creation *is the expression of a thought*, and not the *product of physical agents*. Now, what stronger evidence of thoughtful adaptation can there be, than the various combinations of similar, though specifically different, assemblages of animals and plants, repeated all over the world, under the most uniform and most diversified circumstances? When we meet with pine trees, so remarkable for their peculiarities, both morphological and anatomical, combined with beeches, birches, oaks, maples, etc., as well in

North America as in Europe and Northern Asia, under similar circumstances; when we find again representatives of the same family, with totally different features, mingling, so to say, under low latitudes, with palm trees, and all the luxuriant vegetation of the tropics; when we truly behold such scenes, and have penetrated their full meaning, as naturalists, then we are placed in a position similar to that of the antiquarian who visits ancient monuments. He recognises at once the workings of intelligence in the remains of an ancient civilization; he may fail to ascertain their age correctly,—he may remain doubtful as to the order in which they were successively constructed,—but the character of the whole tells him that they are works of art, and that men like himself originated these relics of bygone ages. So shall the intelligent naturalist read at once in the pictures which nature presents to him, the works of a higher intelligence; he shall recognise in the minute perforated cells of the coniferæ, *which differ so wonderfully from those of other plants*, the hieroglyphics of a peculiar age; in their needle-like leaves the escutcheon of a peculiar dynasty; in their repeated appearance, under the most diversified circumstances, a *thoughtful and thought-eliciting adaptation*. He beholds, indeed, the works of a being *thinking* like himself, but he feels at the same time that he stands as much below the Supreme Intelligence in wisdom, power, and goodness, as the works of art are inferior to the wonders of

nature. Let naturalists look at the world under such impressions, and evidence will pour in upon us that all creatures are expressions of the thoughts of Him whom we know, love, and adore unseen."—(Lake Superior, by Professor Louis Agassiz, page 104 et seq.)

CHAPTER XI.

Mr. Darwin lays great stress on the fact that the whale, which, when adult, has no teeth, has in the young state, distinct rudiments of such organs; and upon their presence, although they never cut through the gums in the calf. With regard to the whale, it would have been fairer if Mr. Darwin had stated that the great majority of the cetaceæ are provided with conical triangular teeth, and it is only the balænida, or whale-bone whale, in which the peculiarity he notices is observed. We cannot account for the appearance of these rudimentary teeth in the young of one section of a family, any more than we can account for the presence of teats in the males of the mammalia. But that this should only occur in one group of the family, and that the rudimentary organs should be of the same type and form as in the other Cetaceæ, is to my mind only an additional proof, were such needed, of the beautiful uniformity which characterizes the whole of nature. Were I to be allowed to speculate upon the subject, I could see in the various uses to which the *substitute for these teeth*, whale-bone is applied by man—another proof of the design and beneficence of the Creator.

In the order of creation there is a singular gradation of organs observed frequently, in members

of the same family, but in every case such a gradation is adapted to the circumstances of existence of the animal. This is remarkably shewn in the family of Scincoids, among existing Saurian reptiles, which has been quoted by Agassiz, in his valuable work on Classification, p. 65, et seq.

This family contains one hundred species, which have been divided by Duméril and Bibron into thirty-one genera. Now it has been found that there are forms living in Europe, Western Asia, North Africa, and the Cape of Good Hope, which *have no legs*. There are others at the Cape of Good Hope with hind legs only, each leg *having a single toe*; and these are likewise found in South America, New Holland, and New Guinea. There are still others, *only found at the Cape of Good Hope*, which have two toes on each foot. Then there are saurians of this family with four legs, among which some having one toe on the fore foot, and two on the hind foot, are from South Africa; those with two toes on the fore foot, and one on the hind foot, live in the Philippine Islands; those with two toes on all four feet, in New Holland, and those with three toes to the hind feet, and two to the fore feet, in Algiers and New Holland. Those with three toes to the fore feet inhabit Europe, North Africa, and New Holland; those with four toes to the fore feet New Holland; with five toes to the fore feet, and four to the hind feet, Bengal; and with four toes to the fore feet, and five to the hind, Africa, West Indies, Brazil, and New Holland.

Those with five toes to all four feet, have the widest distribution, and yet are so scattered, that no single zoological province presents anything like a complete series. On the contrary, the mixture of some of the representatives with perfect feet, with others which have them rudimentary in almost every fauna, *excludes still more decidedly the idea of any influence of physical agents upon this development.*"

Now it will be observed that to make the above series uniform, there are wanting those (1st.) with one toe to each of the four legs; (2nd.) those with three toes to the fore feet and two to the hind feet; (3rd.) with three and four toes either in the fore or hind feet.

Mr. Darwin would doubtless tell us that this speaks for his natural selection theory. What says Agassiz,—"Similar series, though less conspicuous, and more limited, may be traced in every class of the animal kingdom, not only among living types, but also among the representatives of past geological ages; which adds to the interest of such series, as shewing that such combinations include not only *the elements of space, indicating omnipresence, but also that of time, which involves prescience.*"

Again, it is clear that these series indicate selection, but not in the sense used by Mr. Darwin. It is the selection of a thoughtful creative mind; for "the series is not built up of equivalent representation in its different terms, some combinations being richly endowed, others num-

being a few or even a single genus, and others again being altogether disregarded. *Such freedom indicates selection*, and not the working of the law of necessity."—(Page 67.)

With regard to the whales, and their rudimentary teeth, of which so much use has been made by Mr. Darwin in his argument, we find the following arrangement, made by that accurate observer Brisson, a hundred years ago:—

The first order of Cetaceans have *no teeth*, (Balænæ;) seven species.

Second order.—Teeth in the lower jaw only, (Cetus, sperm-whale, etc.;) seven species, in some of which the teeth are pointed, others falciform, and in others slightly recurved. (Why this, Mr. Darwin?)

Third order.—Two long teeth only in the upper jaw; one genus and species,—(Ceratodon.) The narwhal.

Fourth order.—Teeth in both jaws; one genus, five species,—(Delphinus.) The dolphin, etc.

Here we see at a glance the expression of the Creator's thought, and by adaptation to circumstances, the development or suppression of teeth at pleasure. According to Mr. Darwin, by a kind of miracle, the process of growth and development became somehow stopped, and he can only bring forward the supposition of disuse! But we see no evidence of disuse in the toeless saurian, any more than in the rudimentary teeth of the whalebone whale.

Of all animals, however, I think the whale is

the worst Mr. Darwin could have selected to illustrate his theory. If we look at the beautiful manner in which its conical larynx is made to project into the posterior nares, when the animal is breathing, (thus forming a communication with the atmosphere, although the rest of the head may be under water, and the mouth filled,) and the means by which water is consequently expelled in the mere act of deglutition and closure of the pharynx; if we look at the exquisite manner in which the substitutes for teeth, the laminæ of whalebone, allow water to pass through them, but not a single creature, however small, that is destined for the whale's food; if we look at its enormous size,—its wonderful structure,—its residence in arctic seas, producing by its mode of feeding, the principal means of supplying *heat* and food to a large race of human beings,—its curious instincts,—its longevity,—its affection for its young—we have one more unmistakable proof of Design, and of Special Creation—another monument of the Goodness, the Wisdom, and the Omnipotence of God.

It certainly is not worth while to speculate upon the rudimentary teeth in the calf. Mr. Darwin adduces them as a proof that the ox is descended from an animal, which once had teeth in this part of the upper jaw, which, having become unnecessary to the ruminant, were obliterated by gradual disuse. It is equally impossible to answer such arguments, because they have nothing but the merest and wildest

supposition to stand upon. Why should the wisdom tooth remain dormant in the human jaw until the age of puberty? Is man, therefore, descended from an animal which had its wisdom tooth developed in early life with the rest, and which is now becoming obliterated by disuse? We may build, if we like, any hypothesis, however absurd, upon this fact, but without a shadow of proof or probability, it would be the height of folly to expect others to believe it.

And here I may make one or two remarks, upon the strictures of the opponents to Mr. Darwin's doctrines, by the ingenious, but often wild and imaginative author of "Studies in Animal Life," in the "Cornhill Magazine," for April, 1860. "There are three modes," says this writer, "of combating a doctrine. The first is to point out its strongest positions, and then shew them to be erroneous or incomplete. The second is to render the doctrine ridiculous, by pretending that it includes extravagant propositions. The third is to render the doctrine odious by forcing on it certain conclusions which it would repudiate, but which are declared to be the "inevitable consequences of such a doctrine."

Well, now let us apply this to Mr. Darwin's theory. 1st.—I never could discover the slightest evidence of a "strong position" from the beginning to the end of Mr. Darwin's book. 2nd.—If such visions are indulged in, as the development of a goose from an oyster, or a whale from a bear, the statement itself carries so much

absurdity on the face of it, and is so completely opposed to all the known laws of biology, that the ridicule is inherent in the proposition, not in the criticism. 3rd.—If a doctrine assumes, that man is but the advanced development of one of the diverging forms of a primitive primordial organism, which has had an existence beyond the remotest possible idea of time, and will have, in an altered condition, an equally long future on earth;—then, I say, the bible cannot be a true record of Divine Revelation, and I regard this record of infinitely more importance than the opinions of Mr. Darwin or his supporters. And when again he tells us that important structural alterations have proceeded from an accidental variation, and refers the proofs of a Divine Creator to secondary, and unknown, and unintelligible causes, I think no language can be too strong in deprecating such materialism.

The writer of this paper, who (though his articles appear only in popular magazines, the readers of which are not the best judges of their truth,) is still entitled to attention, because he justly lays claim to a knowledge of some of the higher branches of physiology, in his eagerness to defend Mr. Darwin, reverts to the hackneyed question of, what is a species? Nothing, in fact, is easier than to answer the question as it applies to the great mass of living things. An owl, or an oak, are known by characters, which distinguish them from every other analogous or distinct form. They are therefore species. A man, a horse, a

buffalo, an eagle, a pike, are distinct and well-marked species; but because exceptional instances now and then occur from variation, we are told that it is necessary to use such terms as the "unknown element of a distinct act of creation," —that is to say, you refine away all you know to express that which you do not understand.

I have, however, a much stronger objection to make to this writer's views; namely, to the mode of reasoning, by which he arrives at conclusions similar to those of Mr. Darwin, that the vertebrata are derived from one common parent. He says that neither side can bring *proof*. I entirely deny this; I think there is abundant proof of a most satisfactory nature, that each animal in existence, has been created by a Designing Mind, and adapted to the circumstances under which it is destined to live. But how does our critic argue the question? What does he bring on his side, as a substitute for "dogmatic decision?" First of all he takes the family of cats, including lions, panthers, pumas, leopards, tigers, jaguars, ocelots, and domestic cats. Well this is a tolerably good family for his argument, because there is a certain similarity in their habits, which might induce a belief in some minds, of the possibility of their having originated from one progenitor. And I do not object that to illustrate this, (notwithstanding perfectly gratuitous assumption,) that the writer in the "Cornhill Magazine," should bring forward the development of numerous languages, or that he should argue that the va-

rious species of cats do not differ more than the languages of the Spaniard, Italian, Portuguese, Wallachian, and Rhætian, do from each other, although they are all derived from the "fossil" Latin.

This is a kind of reasoning which is sufficiently intelligible to illustrate an assumed fact, and although it by no means either proves it, or gives it a greater plausibility, still there is nothing that one could exactly lay hold of on the ground of false analogy. But the question is carried further, and we are told that because eight languages more ancient still, including the Latin, point to a common origin, which was to them what the Latin is to the six mentioned; *therefore* we may be justified in supposing that all the classes of the vertebrate animals point to the existence of some older type, now extinct, from which they were all developed.

When he carries his argument to this point, he leaves the ground of *possibility*, and his analogy fails. So long as there was no change of type, the variations in a family may be illustrated, by the variations in a language. But as language is merely a function, it is impossible that the analogy will hold good when applied to a total change of structure. There is nothing difficult to conceive in the variation of language. That at one time there was but one, we may be perfectly certain, and that it has varied into all the languages of the world is equally true, and this may be taken fairly enough to shew

the variation of some species. But to bring it forward to illustrate the origin of a fish, a reptile, a bird, and a mammal, from one parent form, is not sound. It must not be forgotten that vertebrate animals of different classes do not merely differ from each other in fins, and wings, and hands, or in living in diverse elements, and breathing, digesting, and circulating their blood in various modes, and by apparatuses very different, but that they are clearly distinct organisms, formed with reference to the individual. A bird, for instance, is not made up of the different parts in a fish, put together so as to constitute a bird, nor is a mammal an aggregate of the constituent organs of a bird; but each mammal, bird, reptile, and fish, has its *most minute parts formed in reference to the individual, and its mode of life.* Each being is perfect in itself, and it would be as impossible, physiologically speaking, to convert a fish into a bird, a bird into a mammal, or to degrade a bear into a whale, as it would be to transmute ideally a man into an oak tree. Not only the form of the skeleton, but the histological anatomy of the bone, is different; not only are the muscles differently formed, and shaped, and attached, but their minute anatomy is dissimilar. The brain and nervous system differ widely in each, and there are no two classes of vertebrata that have the same sized blood discs, or capillary vessels which convey them! How then can the writer in the "Cornhill," a magazine, I presume,

intended for the perusal of the youth of the rising generation, venture on an analogy so false, as that of comparing the variation of a language with the transmutation of organisms, so totally different from each other in minute anatomy, and habits of life? The effect upon my own mind will be merely to doubt that gentleman's analogies in future; but what the impressions may be upon the young, and the thoughtless, when told that they had a common origin with a fish, a snake, a bird, or a beast of the forest, I will not venture to predict. I can only express a hope that the error will be rectified, and the antidote spread as widely as the bane.

In the "British and Foreign Medico-Chirurgical Review," for April, 1860, there is also a very lengthened review of Mr. Darwin's book. The writer is, I dare say, well known among scientific men, in the London coteries. I have, however, not the slightest knowledge of the position he holds in the scientific world, but I assume it to be a high one, from the rank which the Journal, in which he writes, maintains, and also from the general manner in which the article is executed. In a critique, extending over thirty-seven pages of closely-printed matter, this writer does everything he can, to prove the truth of Mr. Darwin's hypothesis. He considers the theory as having hit the exact truth; and he says he does not hesitate to call it a wonderful book.

Whatever may, however, be the position of the writer in the scientific world, I will point out

one or two singular inconsistencies, which makes me, a student in Natural History, not only sceptical of the writer's judgment, but doubtful of the soundness of his inferences.—

1st.—There is nothing upon which Mr. Darwin more strongly insists, than that his theory is incomplete, and not to be proved, by reason of the "imperfection of the geological record." Now this writer occupies a considerable portion of his article, in attempting to shew the truth of Mr. Darwin's book, from the geological record. He proves, however, nothing. The succession of forms in geological time is a fact, which no geologist attempts to deny. "Organic remains," says Professor Owen, "traced from their earliest known graves, are succeeded one series by another to the present period, and never re-appear, when once lost sight of in the ascending search. And not only as respects the vertebrata, but the sum of the animal species, at each successive geological period, has been *distinct* and peculiar to each period."

The reviewer, however, places the facts of a successive analogous fauna, in a very different light. "It may be stated with the highest probability, from the evidence of fossil remains, that a very considerable proportion of those classes of animals now living, whose bones or shells afford means of comparison, are the direct descendants of animals, that existed before the occurrence of those last great changes, which gave to a large part of the surface of the

globe, its present physical features."

Owen puts it in this way.—"No one, save a prepossessed uniformitarian, would infer from the lucina of the permian, and the opis of the trias, that the Lamellibranchiate mollusks existed in the same rich variety of development at those periods, as during the tertiary and present times; and no prepossession can close the eyes to the fact, that the Lamellibranchiate have superseded the Palliobranchiate bivalves." And then, he continues, that to suspect, that the existing genera of siphonated bivalves, and univalves, abounded in permian, triassic, or oolitic strata, and that they have escaped observation, because some Lamellibranchiates, with open mantle, and some holostomatous and asiphonate gasteropods, have been found in secondary strata, "is not more reasonable, as it seems to me, than to conclude that the proportion of mammalian life may have been as great in secondary, as in tertiary strata, *because a few small forms of the lowest orders have made their appearance in triassic and oolitic beds.*"—(Op. Cit., p. 61.)

The reviewer wishes to make out these mammalian remains, as proof of a "great abundance." (See p. 375.)

2nd.—I object, generally, to the inferences of the reviewer, because he has drawn one of great importance to the theory he supports, from facts assumed, but not proved, to be true in geology.

The discovery of *celts*, in strata known to be pre-adamic, was made the subject of a paper, and

comments, by Sir C. Lyell, at the meeting of the British Association, for 1859. Upon this the reviewer remarks, "It may be inferred that man has lived on earth for at least ten times the time, he is supposed to have done." He continues, "that, *although the inference* cannot be regarded as certain, there is a strong probability that the men who made the celts, were contemporaneous with the mammoth, rhinoceros, etc." And further, and to this paragraph I beg to draw particular attention, as it illustrates the mode of reasoning adopted by Mr. Darwin, as well as his supporters:—

"Now when due weight is given to these, (that is the uncertain inferences,) and other considerations, it becomes very difficult to form any conception, as to the introduction of new types of organic life in any other mode than by descent, with modification, from those previously existing."

I need not, I am sure, dwell upon these celts. They have never yet been found to occupy any stratum, in which they could not have been buried by the ancient people, who used them as spear heads. Professor Henslow has several which I gave him, and which were found in the gravel-beds in Suffolk, mingled with bones of the mammoth and rhinoceros. Surely we are not called upon to found an argument against special creation, upon such facts as these?

3rd.—The reviewer is, I think, inconsistent in supporting Mr. Darwin's views, and then scouting his deductions. He thinks it may

be conceded, that birds have arisen from one progenitor, or, at least, he assumes it for the sake of argument, admitting "the possibility:" but then he entirely denies the remotest possibility of birds and fishes, or reptiles and mammals, having had a common origin; and he concludes by the following:—"So too there seems to us so much in the psychical capacity of man, however degraded, to separate him from the nearest of the mammalian class, that we can far more easily believe him to have had a common ancestry with the chimpanzee, and to have been separated from it, by a series of progressive modifications."

Now, of the two opinions I think that of Mr. Darwin's, infinitely the most honest. He states a theory, believes it to be true, and boldly says what he considers, is the inevitable consequence. The reviewer, on the contrary, believes Mr. Darwin's theory right, at the same time that he knocks it down, by writing for the perfection of the geological record, and denying its legitimate consequences.

If Mr. Darwin's theory holds good, as to the common ancestry of the gold-crested wren, and the ostrich, or dinornis, the eagle, and the partridge, the parrot, and the nightingale, the pike, and the minnow, the salmon, and the perch, then in the name of consistency, why is it not good for the monkey, and the man? The reviewer shields himself under the psychical difference. I am afraid Mr. D. will not accept such a compromise.

The best part of this well-written review is the following passage:—"But when we once go beyond the limits of our actual experience, the question, as to the extent of this change, is one as to which we have no data whatever, for any positive conclusion, and we are left altogether to the guidance of probabilities."—(Page 104.)

And now, a few remarks upon Mr. Darwin's arguments from embryology. And the first thing we notice is an erroneous statement in natural history. "The vermiform larvæ of moths, flies, beetles, etc., resemble each other much more closely, than do the mature insects." All breeders of lepidopterous insects which vary, must know that this is not correct. The larvæ, for instance, of *Heliothis marginata*, which feeds on the rest-harrow, (*Ononis spinosa.*) in autumn, differ so much from each other, that you may easily pick out three groups, which an entomologist who did not know the larva, would arrange into at least three different species; but the perfect insect never varies appreciably, except in size.

My friend, the Rev. H. H. Crewe, a gentleman well known among entomologists, for his extensive and accurate knowledge of the larvæ of lepidoptera, sends me the following list, which differ more than do the perfect insects; those with an asterisk exhibit strong and marked varieties:—*A. galatæa*, *A. atropos*, *Sm. populi*, *Ch. elpenor*, *D. coryli*, *T. cratægi*,* *N. camelina*, *N. dictæa*,* *N. dromedarius*, *D. cæruleocephala*, *A. leporina*, *L. lythargyria*, *M. brassicæ*, *M.*

persicaria, T. cruda,* H. dysodea, P. meticulosa,* H. chenopodii,* H. marginata,* R. ocatagata,* O. bidentata,* E. angularia, A. betularia,* C. pusaria,* F. conspicuata, E. linariata,* E. centauriata,* E. Haworthiata, E. satyrata, E. denotata, E. nanata,* E. subnotata, E. absinthiata,* E. assimilata,* E. coronata,* E. sobrinata.*

Then we are told of a group of forms, such as these caterpillars, which, in the majority of instances, hardly move at all, except to and from their food, that the "embryos are active." Mr. Darwin takes this assumed difference between the larva and imago, as one proof that they differ also in structure, and that they are adapted for special uses of life. He also alludes to the resemblance of embryonic existence lasting till a rather late age. He cannot either see why the looped condition of the arteries near the branchial slits, should exist equally in the young mammal, the egg of the bird, or the spawn of the frog; and then, again, he makes a comparison of an equal difficulty, existing in a similarity of the bones in the hand of man, the wing of the bat, and the fin of the porpoise. If, however, Mr. Darwin had not been blinded by his theory, he would have seen at once that the embryos he has mentioned, have to live an aquatic existence before birth. Why, therefore, should not the arrangement in these branchiæ be on the same type, as that which is found to answer so admirably in the gills of the fish?

After some more writing, Mr. Darwin asks,

How can we explain these several facts in embryology: 1st.—The very general, but not universal difference in structure, between the embryo and the adult.

It is difficult to understand how this could have been otherwise, as far as external appearances, the worst of all guides in the matter, is concerned. The embryo is the germ only, of the future animal. It is a structure as yet unfinished, and of course appears different. Look at a caterpillar. How unlike a butterfly! Yet when it makes its final change into a pupa, you can trace in the pupa-case all the organs,—wings, legs, antennæ, eyes,—of the future insect! Break the pupa into two parts, and you will find it hollow, containing a fluid. Still how unlike a butterfly. In a fortnight or more, if left under the circumstances which the species requires, your pupa splits, and out comes a perfect insect! Who will say that at least the pupa did not foreshadow the insect, and yet how different?

2nd.—"Parts in the same individual embryo, which ultimately become very unlike, and serve for divers purposes, being at this early period alike." This question has been answered before. If the embryo has to exist as a fish, it is provided with branchiæ in early life, as the reptile is. The visceral arches in the embryo of the human frame are in no way analogous with the branchiæ of fish, inasmuch as they are converted into the bones of the face.

3rd.—"Embryos of different species within the same class, generally, but not universally resemble each other." A great deal too much has been made out of this fact by theorists. M. Serres has founded upon it the following generalization:—"Human organo-genesis is a transitory comparative anatomy, as, in its turn, comparative anatomy is a fixed and permanent state of the organo-genesis of man." "But," as remarks Professor Bennett, (Outlines of Physiology, p. 130,) "that the human embryo ever resembles a worm, a mollusc, reptile, fish, or bird, can, on careful examination, nowhere be recognised. It is true that at one time all ova *resemble* each other; but it is equally certain, that from the first moment of their formation, they are impressed with a power of developing themselves only in one direction, so that the ovum of a reptile, fish, or bird, will always be developed into similar animals, and by no concurrence of circumstances, will ever be transformed into different ones."

This obvious truth, speaking at once to the conviction, ought to put an end to all the theories which have been raised, upon the simple fact of the early similarity of vertebrate embryos.

4th.—"The structure of the embryo is not closely related to its condition of existence, except when the embryo becomes at any period of life active, and has to provide for itself." Why should the structure of a transitional organism be related to that with which it is not

destined to have any ultimate connection? Its organization is not permanent, but that this is sufficient for the circumstances of its transitory life, is a fact which needs no illustration. As a general truth, nothing can be more perfect than the means provided for embryonic life and growth.

5th.—"The embryo apparently, has sometimes a higher organization than the mature animal, into which it is developed."

As this depends entirely upon the arbitrary characters given by naturalists to the term "higher organization," we may at once dismiss it as a simple error of judgment, in those who do not distinguish between the relative terms, embryo, zooid, and individual. Mr. Darwin, however, reasoning upon the above five propositions, as though they were literally true, thus attempts to account for them, according to his theory,

First, he concludes, "it is quite possible that each of the many successive modifications, by which each species has acquired its present structure, may have supervened at a very early period of life; in other cases *it is quite possible*, that they may have appeared at an extremely early period."

Secondly, he considers that at whatever age any variation first appears in the parent, it tends to re-appear at a corresponding age in the offspring."

These conclusions were arrived at from the following experiments, among others:—He measured the puppies and parents of greyhounds, and

bull-dogs, at six days old, and found that they had not nearly "acquired their full amount of proportional difference."

The same experiment with the foals and mothers of the cart-horse, and racer, gave similar results. So with all the race of domestic pigeons, and their proportional differences in the specified several points of beak, width of mouth, length of eyelid, size of foot, and length of leg, were very much less when compared with the blue-rock, than in the full-grown birds, with one remarkable exception, namely, the short-faced tumbler.

Alluding to the above measurements, Mr. Darwin remarks, "Fanciers select their horses, dogs, and pigeons, for breeding, when they are nearly grown up; they are indifferent whether the desired *qualities* and *structures have been acquired* earlier or later in life, if the full-grown animal possesses them. *And the cases just given, more especially that of pigeons*, seem to shew that the characteristic differences, which give value to each breed, and which have been accumulated by man's selection, *have not generally first appeared at an early period of life, and have been inherited by the offspring at a corresponding not early period.*"

So that because the pigeon, twelve hours old, an imperfect organism, with one part, according to the laws of development, more advanced than another; because this half-formed pigeon does not, at twelve hours, shew the proportions of difference in structure which is exhibited by the full-grown bird, and the presumed original stock, the blue-

rock—*therefore*, at a remote period of the pigeon's history, it *acquired*, accidentally, some altered structure at a later period of life, which will be shewn by the present young bird, when it reaches that age!!

And see how this monstrous piece of reasoning is applied to Mr. Darwin's doctrine. He takes a genus of birds, which, according to his views, have descended from a common parent, and become diversified in form, etc. Then he says, that those many slight successive steps of variation, "having supervened at a rather late age, and having been inherited at a corresponding age, the young of the new species of our supposed genus, will manifestly tend to resemble each other much more closely than do the adults, just as we have seen in the case of pigeons." In fact, if we take a bird just out of the egg, it represents, according to Mr. Darwin, the permanent condition of *one* of that bird's ancestors. Every hour gives a new phase—presently feathers begin to spring out, *that* represents the former conditions of the bird at a later period, and so on till it flies away, when it has reached the last variation, which constitutes it the perfect bird. "For the embryo is the animal in its less modified state; *and in so far it reveals the structure of its progenitor.*"—(Page 449.)

Then Mr. Darwin carries these views up to families, or even classes. "The fore-limbs, for instance, which served as legs in the parent species, may become, by a long course of modifi-

cation, adapted in one descendant to act as hands, in another as paddles, in another as wings;" and upon the above principles, the fore-limbs will resemble each other closely, for they have not been modified. But the new species will differ greatly, because the limbs in the mature animal have undergone much modification at a rather late period of life, having thus been converted into hands, paddles, or wings."

The writer in the "Cornhill Magazine," would, I dare say, be very angry if I were to treat these most remarkable suppositions with ridicule; and he would, doubtless, be very much shocked were any one to suggest the probability of modification of structure being produced in an animal by "exercise" and "disuse," (page 447,) so as to convert it into a different species, as being anything akin to atheism! And yet I shall fall under this writer's condemnation, for I certainly consider that when statements are utterly opposed to *known* facts, and not supported by any proof, they are quite open to ridicule. When they go beyond this, and attribute the Design of God to chance, then such writing is atheistical.

But I am going to mention one or two facts, for, unfortunately, the people who read these pernicious writings, are those who are not expected to know anything of physiology; and if statements are made, that are plausible on their face, they are too apt to accept them as truths.

I deny then, *in toto*, that the phases of the embryo represent anything which the most vivid

imagination can picture to itself, of a grade of permanent forms of once living beings. The facts have become well known, from experiments upon inferior animals, as the dog, rabbit, etc. Professor Bennett has given, in his "Outlines of Physiology," p. 166, et seq, a series of twenty-eight figures, taken from the plates of the celebrated embryologist Bischoff. I mention these instead of the originals, because they are more accessible, and the nature of the subject requires references rather than details.

Professor Bennett has also a series of wax-models of each of these phases, in the development of the embryo of the dog. Now what do we see?—Why *continuous development*. The embryo is from beginning to end imperfect, and there is not one figure, except that of the ovum, which can, by the most prejudiced believer in natural selection, be turned into the likeness of any living thing. The organisms are all incomplete, they do not fulfil the essential elements, which can be summed up into a living animal; and the last, that which is seen when the shape and form is becoming discernible, has all the viscera exposed, and is as unlike anything we can conceive to represent a living permanent creature, as can possibly be imagined. But what we do see, is the most beautiful series of changes in the formation of the being. A great deal of light is thrown upon the mode of development in living things, by these observations of Bischoff, but they utterly annihilate the doctrine of permanency of

form, being represented by the phases of development in the embryo.

As to the "accidental" modification of the bird's wing, so as to convert it into a paddle, or a hand, the idea is so utterly preposterous, that one can hardly find patience enough to notice such a thing. What does Mr. Darwin mean by inheritance? Does he mean that a bird, having modified its wing by "exercise" or "disuse," into a hand or a paddle, that this modification would be inherited by an oviparous, or a viviparous progeny? Does he believe that the bird, during the "countless ages" the wings must have occupied in being modified, had "accidental variation" fitting in other parts, so as to convert the bird into a mammal?

But the whole supposition is absurd in the extreme. How can an organ formed for flying, be converted, by "accidental variation," into one adapted for grasping? into an organ so exquisitely formed as the human hand? Or what analogy is there between such a change, and that produced in the wattle of the carrier, or the beak of the tumbler, by the fancier of pigeons?

In the one case you pamper a bird with food, and keep it in close confinement, until you so affect the nutritive organs of the animal, as to destroy the balance between excess and deficiency of nutrition, and the bird varies either in having too much, or too little horn in its beak; too many or too few feathers in its tail, or if pampered to extreme, perhaps a wattle grows on its beak, just

as an alderman's nose gets red under turtle soup. The fancier seizes hold of the change, and manages to perpetuate part of this variation, so as to give an abnormal character to his bird, for none of these fancy pigeons are natural forms, and thus, in course of time, he produces what appears to be a distinct variety!

But Mr. Darwin invents a power in nature like that of the pigeon fancier, which he imagines to be ever present, to "take advantage" of any accidental modification of structure in the wing of the bird. This mysterious power, working through endless ages, is gradually changing the wing, which is formed for carrying the bird through the air, into a hand, which is part of the structure of the human race, or monkey. Here everything is left to imagination. What becomes of the unhappy bird, in its myriads of intermediate stages between a bird and a monkey, or man, we are not told; but we are simply asked to believe, (because it is a part of Mr. Darwin's theory,) that organs, though at first sight somewhat alike, yet so different; designed for other purposes, and occurring in animals of natures which have nothing in common; adapted for different positions in the great scale of nature;—the one a beast that perisheth, the other a reasoning being, with a soul endowed with immortality, and made in the express image of Him, by whom all was designed; that these organs should be altered by the result of a chance variation;—such an opinion as this is, I say, so absurd, that in spite of the wrath

of the writer in the "Cornhill," I must take the liberty of treating it with ridicule.

I have made use of the various proofs of design and special creation, which are to be drawn from the works of nature, or the beautiful structure of organized beings. But an equally strong argument may be drawn in favour of both, from the diseases with which the human body is afflicted. Nay, I doubt much, if a stronger case against Mr. Darwin's views can be made out from any other of the vast store of facts at our command.

There is nothing more wonderful in the whole scheme of creation, than the mode by which a broken bone is restored; or the protecting arm, by which the *vis medicatrix naturæ* resists the encroachment of an aneurism, or the rupture of a fatal abscess, which may be invading some vital spot in the system. Now, this preservative power exists in all animal structures, in the lowest zoophytes, as well as in man; and it clearly and unmistakably displays the provision of a wise and beneficent Being, for events which He alone knew would happen, and without which the great world He had created, would have been incomplete.

But, though like structures have a similar principle of reparation and conservation, the diseases of the animals of creation, as every one knows, are essentially different, and in many cases peculiar to the genus or family. Could these diseases have been imposed on man, for instance, by "natural selection?" How the whole mythical

absurdity crumbles into dust," when the mind, educated in the laws of life, and conversant with the forms of human disease, ponders for a moment upon such an explanation.

This subject has been well and beautifully handled by Simon, in his "Pathology," and I cannot forbear quoting the following passage, (page 17:)—

"We find that disease works according to laws definite, constant, invariable; we find in it no contradiction to the laws of life; on the contrary, that the latter, in their simplicity and comprehensiveness, include and account for it; that the power of adaptation to circumstances, the power of resistance to casualties, the power of repair after injuries, would not be possible or conceivable attributes of the human body, except under conditions which impose the liability to disease. At every turn of the subject, and in every fresh illustration, which new study reveals to us, we derive deeper and more steadfast convictions of the total absence of caprice, chance, or irregularity, even in the strongest influences of disease. We become habitual observers of that mystery, which most of all tends to chasten and elevate the mind: observers, namely, of the unbroken uniformity which prevails in the operation of natural laws. Standing in the daily exercise of our profession, amidst an apparent chaos of darkness and suffering, where all at first seems as of yore, 'to be without form and void,' it is one great privilege, that by the aid of scientific in-

sight, we are raised to a recognition of the 'Spirit which moves upon the face of the waters,' and which now, as in the first morning of creation, resolves that chaos into harmonious order, that darkness into intelligible light, that suffering into the feeble counterpoise of some greater or more extensive good."

If we believe Mr. Darwin, his ancient primordial fungus must have contained within itself all the elements necessary, not only to people the whole world with living things, but the principle by which the advanced growths of these times resists the encroachments of disease, or repairs the injuries of accident.

CHAPTER XII.

Since the MS. of this work was sent to the press, I have read the discussion at Oxford, and beg to offer one or two remarks upon the arguments of Professor Huxley and Dr. Hooker, the two champions of Mr. Darwin's views.

Professor Huxley says that Mr. Darwin's theory is not an hypothesis, but an explanation of natural phenomena. Now really, I think this is drawing rather too strongly upon our credulity. Surely Mr. Huxley cannot mean that the doctrines of "natural selection" and "variation of species," are mere demonstrations of nature? If so, the whole question would be out of the range of argument. For my own part, I conceive that Mr. Darwin's theory fails, not only from the want of facts, but by the misinterpretation and misapplication of both real and assumed natural phenomena. Mr. Darwin sees a shrike taking its bath on a hot day, and he claims this as an instance of "divergence in character" from the shrike to the kingfisher. He sees a substitution of whalebone for teeth in one genus of a family, all the rest of which have teeth; and because in the former the teeth are found rudimentary, Mr. Darwin believes that the animal could not have been thus imperfectly specially created, and claims it as an instance of variation by natural selection!

I need not again go over ground which has already been trodden. But then, continues Mr. Huxley, with singular inconsistency, "Without asserting that *every part of the theory had been confirmed*, he maintained that it was the best explanation of the origin of species which had yet been offered."

Of course an assumption like this cannot be argued. It is a mere opinion, as proofless as the theory it attempts to support. Mr. Huxley further remarks that "man was once a monad—a mere atom, and nobody could say at what moment in the history of his development, he became consciously intelligent."

Surely Mr. Huxley must have here been misreported, for of all natural phenomena, none are more exquisitely beautiful, and at the same time more damaging to Mr. Darwin's theory, than those which we observe in the study of embryology. That atom, to which Mr. Huxley alludes, contains within itself, the elements for development into the future conscious being, and nothing else; and it is unphilosophical to compare it with a monad, or any other, either mature, or embryonic organism. No other atom of matter in the world is similar, except in external form, or chemical composition, to that germ. Because it is cellular, and contains a nucleus, is it correct to say that it is similar to another nucleated cell, which would ultimately become a fish or a bird? Because we cannot see, still less understand, the process of development, or rather the *power* which guides that

process, are we to assume that it can by any stretch of imagination, even be considered analogous to any other germ, in which the process is the same, while the end is entirely different? Surely not. That this atom passes through the phases of being, resembling somewhat in shape the permanent condition of other animals, is only one of the ten thousand beautiful examples of harmony, in Creative Wisdom. I hope we shall very soon banish from our system of philosophy, arguments founded upon the grossest misapplications of creative law. Professor Huxley further remarks, "The question was not so much one of a transmutation of species as of the production of forms, which become permanent."

But this is entirely going away from Mr. Darwin. If the theory were true, there could be no such thing as permanence, as Mr. Darwin admits, when he expresses a belief, that "*no living thing is destined to transmit its form unaltered to a far distant posterity.*"

Dr. Hooker again, in his answer to the Bishop of Oxford, remarks, "The first of these doctrines, *(transmutation of existing species one into another)* was so wholly opposed to the *facts*, *reasonings*, and *results* of Mr. Darwin's work, that he could not conceive how any one who had read it, could make such a mistake."

As I did not hear the Bishop's remarks, and as I see nothing opposed to Mr. Darwin's theory in the report published in the "Athenæum," I am driven to the conclusion that Dr. Hooker, on

the part of Mr. Darwin, denies the hypothesis of "transmutation of species," as it is generally understood among naturalists. If such is Dr. Hooker's meaning, he gives up Mr. Darwin's theory altogether; for without such transmutation it falls to the ground, by its own inherent absurdity. If Mr. Darwin's bear catching flies is ultimately converted into a whale, what is this? Time, of course, must be granted for such a change, but whether it is one year, or one billion of years, the fact of the transmutation is equally the same, and the argument will apply against such a change, however effected, as though it took place in a day, or week, or year.

I hold such a doctrine to be opposed to every known fact in science, and without it, how can Dr. Hooker claim for his variations, the ultimate character of species. If Dr. H.'s group of plants, which he ingeniously compares to a cob-web, having a species in the centre, the radiating and concentric lines being variations, while the connecting links are distinct; if this group is an ever-changing series of forms, which ultimately become species, how is this done, except by "transmutation?"

But how does Dr. Hooker determine the specific or generic value, of each member or section of his group? Why, by some characters that are fixed and unvarying. If not, he is stopped *in limine*, and refers back the "variation" to its species, or he breaks up, or enlarges his genus. Now I contend that if there were processes of

continual change going on in the plants, he could not affix to them the arbitrary characters, by which they are now classified. An industrious and highly-gifted man like Dr. Hooker, is, of course, continually splitting up, as it were, the species of the vegetable world, and placing them in groups, according to their affinities. He is exercising human intellect, and human knowledge, in unfolding the plan of a Divine Creative Intelligence. If he fails in discovering those distinctive characters, by which species are separated from mere accidental, climatic, or functional variation, this is no proof against separate creative force, but only another in the long list of failures, in endeavouring to comprehend Infinite Wisdom.

What human intellect will dare to limit, or define the physical boundaries, by which he determines his species, the investigations into which are for the most part carried on by microscopical examination, which is open to a hundred sources of fallacy? No two men are hardly even now agreed, upon the true value of characters, by which species may be separated from varieties. Are we then prepared to say, that because the lines of the ideal botanical cobweb, present strong analogies to each other, and to one central plant, that they are plants in a transitional condition? And are we to found, upon such data as this, the doctrine of progressive development and transmutation of species, at the cost of the great truth of special creation? And are we to be told if we do not accept the theory, which is founded

upon such arguments as these, that it is because we substitute sentiment for intellect, or that we are unable to "grasp"* the subject? Were such men as Paley or Bell, or are such men as Agassiz or Owen, unable to comprehend such reasoning? Let us, above everything, have this matter argued fairly, and not encumbered by the assumption, that the doctrine of Mr. Darwin is not believed, because it is not understood. Dr. Hooker makes, I think, a great mistake, when he states that the belief in the original creation of species, was "merely another hypothesis, which, in the abstract, was neither more nor less entitled to acceptance than Mr. Darwin's; neither was it, in the present state of science, capable of demonstration."

I answer to this—

1st.—If I take a living animal, I find in it a beautiful system of organs, endowed with the faculties of performing separate functions, the sum total of which constitutes the life of the being. I find that these functions are performed according to a fixed, and evidently pre-ordained series of laws. I place the fact of the existence of these organs, and the performance of these functions, in conjunction with the position of the creature in the world, and I find that by the exercise of my reason, I can form no other deduction, than that all this was specially provided by the distinct creative act of a Great First Cause. I find all the parts of the creature act harmoniously and co-ordinately one with another; and therefore

* See "Gardener's Chronicle," May, 1860.

I draw the further sound induction, that they were pre-ordained to act collectively for the good of the animal, and that they could not have been produced by "variation," "natural selection," "divergence of form," or any other of the elements of Mr. Darwin's theory.

2nd.—I take a view of the more intricate structure of any single organ in the animal, and I find it congruous and complete, not indicating a transitional phase of organization, but a thing which is in itself perfect, which could not be formed, or improved by the highest exercise of my reason; which would be spoiled were I to add to it, or subtract from it; which is exquisitely adapted to the condition of the animal in the world in which it lives, and for the fulfilment of that animal's destiny; and again I say, I have the highest possible proof that I am dealing with an organism, specially and distinctly created by Infinite Wisdom.

3rd.—I take all the animals and plants in the world. I give a rapid glance at all animated nature, and I find earth, air, and water, peopled with a vast assemblage of living things. I find them variously organized, and most wonderfully and fearfully made. I see plants of every kind adapted to every climate, affording the means of life to myriads of beings more highly organized. I see the sun shine, and the rain fall, and the spring succeed to the cold of winter, and the fruitful summer bringing its rich harvests, and I say in all this there is design and adaptation. I see, fur-

ther, vast groups of animals, all specially provided for, according to their position in the scale, with man at the head, endowed with reason and consciousness. I exercise my inductive faculties, and I have *proof* that the gilled and finned fish was formed to live in water, that the winged bird was specially created for flying, that the various animals in the scale of mammals, have all a structure adapted to the climate in which they exist, to their means of procuring food, provision for their safety, and propagation of their kind. Am I to be told that my induction of a special creation here is false?

Is such a proof to be placed in comparison, for a moment, with the mythical dreams of a human intellect, producing a system of creation, which acts neither by miracle or law, which has everything to assume from its primordial germ, down to the vast living world around us!—which has to create anti-silurian worlds, supposed to exist for billions of years before the oldest geological formation!—which compares the operation of Nature's laws, to those of the pigeon-fancier!—and her beautiful and perfect organisms, to his abnormal deformities!—which destroys every vestige of a shadow of belief in a watchful Providence, and adaptive creation, and which strikes deeply and irrecoverably at the root of both natural and revealed religion?

God forbid that I should allow such a doctrine as this to be placed, for one moment, in comparison with that, which the highest intellects

that ever adorned the world, have incontestably proved to be true.

And here I will make a remark upon a passage, contained in the last edition of Mr. Darwin's book, which I confess that I read with mingled feelings of astonishment, and regret. It is as follows:—

"A celebrated author, and Divine, has written to me, that 'he has gradually learnt to see that it is just as noble a conception of the Deity, to believe that He created a few original forms, capable of self-development into other and needful forms, as to believe that He required a fresh act of creation to supply the voids caused by the action of His laws.'"

I think we ought to have had the name of this Divine, given with this remarkable statement. I confess that I have not yet fully made up my mind, that any Divine could have ever penned lines, so fatal to the truths he is called upon to teach. How does he reconcile the origin of man from one of a few forms, with the history of Creation, as contained in the first chapter of Genesis? If this Divine doubts the truth of the Mosaic account, how does he reconcile the doctrine of *progressive development*, with that of original sin, and the consequent necessity for a Redeemer? If man is only a superiorly-developed ape, when in his history did he emerge from apehood into manhood? According to Mr. Darwin, the change must have taken immense time, and have been most gradual, for *Natura non facit saltum*. Now

at what period, in the transitional history of the human race does this Divine fix upon, as that to which the Mosaic account, upon which our religion is founded, refers?

We must have no trifling upon this subject. By the passage I have quoted, Mr. Darwin has opened out a much wider issue, which his injudicious friends have helped to enlarge. It may be urged, that the same argument was used against geological discoveries. I deny the force of this entirely. There is this difference between the two—that while, by a different interpretation of a few words in the first chapter of Genesis, geology can be reconciled with Scripture; *yet, if Mr. Darwin's theory is true, the whole Mosaic account of creation must be false*, and thus a blow is struck at the root of religion itself. If Mr. Darwin, or his friend, says, "but man was one of my original forms specially created *in the beginning of time*," he is equally opposed by Scripture and geology, both of which define his special creation at the same time.

If no other species was specially created, it would be most unwise to say that man was; and nothing can be further from the meaning of the Darwinian school than this, as was clearly evidenced by the line of argument taken by Professor Huxley, at Oxford, in opposition to Professor Owen, in order to prove that the anatomical difference was greater between the highest and lowest monkey, than between the highest ape and man.

I repeat again, there must be no trifling with this subject. The followers of Mr. Darwin are, it is clear from the discussion at Oxford, each of them in turn desirous of throwing down the pillars, upon which the theory is built. Mr. Huxley does not consider that it depends so much upon the transmutation of species, as how species become permanent, both of which opinions are utterly opposed to the teaching of Mr. Darwin's book. Mr. Lubbock accepts the theory, but thinks time has nothing to do with it; whereas Mr. Darwin, not satisfied with two billions and two hundred million years, is obliged *to imagine a world equally long at least before this, and to believe in a future of the same magnitude;* while Dr. Hooker denies that the conversion of a bear into a whale, a fish into a flying squirrel, or a bustard into an ostrich, are instances of transmutation of species!

Surely we do not require that "grasp of intellect," alluded to in the "Gardener's Chronicle," by the gentleman who lays claim to a prior announciation of the natural selection theory, to understand a system built upon a bed of sand, and with materials which are tumbling about the ears of those, who are trying to strengthen the tottering structure!

In addition to the report of the Oxford Meeting, I have also just seen (July 24th.,) the number of "The Quarterly Review," for July. It is singular that the writer of this powerful article should have taken the same line of argument as

is adopted in this work, using, in many places, the same quotations. It gives me the greatest pleasure to add the high testimony of the Quarterly, to the correctness of the line of argument I have chosen, in objecting to Mr. Darwin's book, in proof of which I copy the following quotations:—

On Transmutation.—"We think it difficult to find a theory fuller of assumptions; and of assumptions not grounded upon alleged facts in nature, but which are absolutely opposed to all the facts we have been able to observe."—(Page 237.)

On the geological part of the theory.—

"Now if the geologist can shew clear proofs of continuous deposit, and yet many distinct plants and animals in the succeeding formations, what becomes of that immense lapse of ages, which should transform the palæozoic permian type into the distinct secondary or triassic form? All such links are absolutely wanting, even in these tracts, and in many others, where the conformable, and gradual transitions between formations, proves that there is between them no break, and where everything indicates quite physical transition, and which yet contain utterly different remains. How then can we account for such distinct forms of life in the quietly succeeding formations, except by distinct creations?"—(Page 242.)

Again.—"Now it is proved by Sir R. Murchison, and admitted by all geologists, that we

possess these earlier formations, (pre-silurian,) stretching over vast extents perfectly unaltered, and exhibiting no signs of life.....If these forms of life had existed, they must have been found. Even Mr. Darwin shrinks from the deadly gripe of this argument."—(Page 245.)

On the sterility of hybrids.—

"But though this objection (the geological one) is that which is rated highest by himself, there is another which appears to us in some respects stronger still, and to which we deem Mr. Darwin's answers equally insufficient—we mean the law of sterility affixed to hybridism. If it were possible to proclaim more distinctly, by one provision than another, that the difference between various species was a law of creation, and not, as the transmutationists maintain, an ever-varying accident, it would surely be by the interposing such a bar to change, as that which now exists in the universal fruitlessness, which is the result of all known mixtures of animals specially distinct.....How then does Mr. Darwin dispose of this apparently impassible barrier of nature against the transmutation theory?

He urges that it depends not upon any great law of life, but mainly, first, on the early death of the embryo, or, secondly, upon the imperfection of the reproductive system in the male offspring. How he conceives this to be an answer to the difficulty, it is beyond our power to conceive. We can hardly imagine any clearer way of stating the mode in which a universal law, if it existed,

must act, than that in which he describes it to disprove its existence."—(Pages 245-6.)

On the whole theory.—

"On what then is the new theory based? We say it with unfeigned regret, in dealing with such a man as Mr. Darwin, on the merest hypothesis, supported by the most unbounded assumptions."—(Page 248.)

....."In the name of all true philosophy, we protest against such a mode of dealing with nature, as utterly dishonourable to all natural science, as reducing it from its present lofty level, of being one of the noblest trainers of man's intellect, and instructors of his mind, to being a mere idle play of the fancy without the basis of fact, or the discipline of observation."—(Page 250.)

On the question of creation of organized beings, as "eggs, or seed, or full-grown? and in the case of mammals, were they created bearing the false mark of nourishment from their mothers' wombs?"—(Darwin, 483.)

To these questions we have the following fine answer:—

"It is inherent in the idea of the creation of beings, which are to reproduce their like, by natural succession; for in such a world, place the beginning where you will, that beginning *must* contain the apparent history of a *past*, which existed only in the mind of the Creator. .....If, with Mr. Darwin, you consider man to be an improved ape, you only carry the difficulty

up from the first man to the first ape; if, with Mr. Darwin, in violation of all observations, you break the barrier between the classes of vegetable and animal life, and suppose every animal to be an improved vegetable, you do but carry your difficulty with you into the vegetable world; for how could there have been seeds, if there had been no plants to seed them? and if you carry up your thoughts through the vista of the Darwinian eternity, up to the primæval fungus, still the primæval fungus must have had a humus, from which to draw into its venerable vessels, the nourishment of its archetypal existence, and that humus must itself be a 'false mark' of a pre-existing vegetation."—(Page 253.)

On the religious question, this able reviewer remarks, "The words graven on the everlasting rocks, are the words of God, and they are graven by His hand. No more can they contradict His word, written in His book, than could the words of the old covenant, graven by His hand on the stony tables, contradict the writings of His hand in the volume of the new dispensation. There may be to man difficulty in reconciling all the utterances of the two voices. But what of that? He has learned already that here he knows only in part, and that the day of reconciling all apparent contradictions, between what must agree is nigh at hand."—(Page 257.)

"Few things have more deeply injured the cause of religion, than the busy, fussy energy with which men, narrow and feeble alike in faith

and in science, have bustled forth to reconcile all new discoveries in physics with the word of inspiration. For it continually happens that some larger collection of facts, or some wider view of the phenomena of nature, alter the whole philosophic scheme; whilst revelation has been committed to declare an absolute agreement, with what turns out after all to have been a misconception, or an error. We cannot, therefore, consent to test the truth of natural science by the word of revelation. But this does not make it the less important to point out, on scientific grounds, scientific errors, when those errors tend to limit God's glory in creation, or to gainsay the revealed relations of that creation to Himself.

To both these classes of error, though we doubt not quite unintentionally on his part, we think that Mr. Darwin's speculations directly tend."—(Page 257.)

I make no apology for introducing the above extracts from this masterly review into this work. They are written in a truly scientific spirit, and with a high-minded feeling and tone, which in this country at least is recognised as the evidence of deep thought, and as a true view of the relations of science to our conceptions of truth, and the reverence with which we instinctively regard the marks of a great and infinite mind in all created things.

There is, however, one part of the article in this review, upon which I have a word or two to offer. The reviewer is extremely delighted with Mr. Darwin's description of the ants' visit

to the camp of the aphides, and stimulating these insects with their antennæ, by which it is assumed they are made to excrete honey-dew, upon which the ants feed. The reviewer will perhaps be surprised to hear that the whole statement is founded upon one of those erroneous observations, which too often find their way into works upon natural history. Anyone who will take the trouble of making the observation with care for himself, will be convinced of the following facts:—1st.—That the excretion of honey-dew goes on *pari passu* with the amount of juice obtained by the aphis from the plant upon which it feeds. 2nd.—This excretion is entirely independent of any irritation caused by the antennæ of the ants. 3rd.—The ants have no intention by the movement of their antennæ of exciting the aphides to excrete; such motion being always observed in the ant when it is eagerly expecting food, whether it be the excrement of the aphis, or sugar placed by the observer.

The experiment is very easily performed. Get if possible, an apricot or peach, or some round fruit covered with aphides, and place it under a gluss on a sheet of white paper. In two hours there will be a ring of glistening honey-dew on the paper all round the fruit, while, at the same time, the natural excretion of the insect will be going on. Now introduce one or two ants. At first they will be considerably frightened, instead of trembling with watery mouths for the expected

feast. Presently, however, they will begin to feed upon the honey-dew, moving their antennæ with great rapidity; and during the time they are running about the aphides go on excreting as usual,—but neither more or less. Try the same experiment with a similar fruit covered with sugar, and the antennæ of the ants will move just as fast. If the excretion does not fall off the fruit or leaf, it sinks down among the flock, and is lost to sight, producing there the well-known honey-dew, which is the nidus of fungi, and hence of many well-known diseases. The supposition that the aphis will wait for several hours to perform a natural excretion, and that either they expect to be tickled by the antennæ of ants, or that the ants have the slightest intention of doing anything of the kind, is a delusion which anyone may dispel for himself by a very simple observation.

I have now brought the remarks which I have to offer upon this book, to a close. The subject is far from being exhausted, but I think the time is not far off when everybody will have had enough of "natural selection."

I can truly say, that I am sorry that the book was ever written, for its effect must be to diminish the fame of its author, and to unsettle the mind of the public about scientific pursuits. The "Vestiges," to say the least, attributed the alteration of species to a distinct act of the Divine will. Lamarck gave us something by which we could carry on the changes with the theory,

But "natural selection" does neither. *It attributes everything to chance.* An imaginary power takes the place of design; a series of imaginary laws, which have no congruity, take the place of the laws of life; wild speculation is made to supersede proof, and the proof that is tendered is founded upon a false interpretation of facts, or facts have been imagined to replace realities. From beginning to end the book is a cheerless, gloomy narrative. It destroys every vestige of the beautiful from the mind, without replacing it with even a plausible or intelligent theory. It is the great mistake of the age in which we live, and I hope, for his own sake, and for those whose principles it is calculated to unsettle, that not only will the greater work, with which we are threatened, never see the light, but that this will be speedily withdrawn from circulation.

Perhaps, however, I am mistaken as to the effect which the opinions of such a book as this may have upon the public mind. We live in a remarkable age. We are told that, as a nation, we are prosperous above all others in the world; that we are increasing in knowledge as a people; that new discoveries in science and art are daily proving the superiority of reason over the instinct, which abiding, as it was first imprinted in the nature of the animal, like the beaver, builds its house as did the first beaver the world ever saw; or, like the gorilla, slings his hammock in the trees of Africa, the same imperfect roofless dwelling it has ever made. All this is true, but

there is one feature of the present age which must not be disregarded, or held lightly, by those who think at all about the destinies of a country favoured above all others in the world, and that is, its national indifference.

It cannot be denied that such a feeling seems to have crept in with our prosperity, and has mingled itself with our greatest national interests. We see it every day in the progress of political or secular events. Are we to permit such a state of apathy to find us unmoved, while the great charm which gilds our appreciation of the beautiful in nature is being swept away? Are we to look with calmness, or indifference, or acquiescence, on doctrines which rob life of that by which its loftiest and noblest aspirations are sustained? Are we to look on with coldness, while the daily Providence of God in Creation, and even His existence there, are denied?

No, I cannot believe this! for the mountain top, in its gloomy grandeur, shall still invoke its living testimony, and the eagle and the vulture shall there proclaim the design, which formed and adapted them to their home and position in the scale of being. The great deep shall have its mighty whale, or its fairy nautilus, speaking of the wisdom of its Maker.

The forest or the beetling rock shall still be alive with the hum of insects, or the carol of the bird. And man shall still walk through the scenes made by design for him and for his happiness, and as he looks into that vast assemblage

of wondrous beauty, and as he contemplates the riches which surround him, he shall rise far above the cold and Platonic prejudices of a degraded Pantheism. He shall think with unclouded reason as his monitor; and in every living thing, whether the flower that sends its perfume into the air, and which gladdens him with the harmonious beauty of its colours;—whether the insect which lives its brief day in the summer sun, or the bird which rings through the grove its song of melody; or still more in the contemplation of that crowning intellect, which marks man as the head of created things—in all these he shall continue to see a special creation, an adaptive, thoughtful Design, an immutable species, and a Great First Cause.

THE END.

P. PANTON, ENGRAVER AND PRINTER, EASY-LODGE, BRITFIELD.

ERRATA.

Page 3, 12th. line, for "tells him," read "tells us."
Page 14, 6th. line, dele semicolon, and insert comma after "creation."
Page 16, last line, for "imaginable," read "unimaginable"
Page 30, 5th. line from bottom, read "cattle *are* descended."
and 3rd line, read "thinks *are* descended."
Page 39 et seq., for "Woollaston," read "Wollaston."
Page 88, for "Comptes Rendues," read "Comptes Rendus."
Page 114, 8th. line, for "humeras," read "humerus."
Page 145, 10th. line from bottom, for "then," read "than."
Page 151, 3rd. paragraph, 2nd. line, transfer the comma after "uses" to the following word.
Page 155, 6th line, full stop after "grub."
Page 157, 11th line from bottom, read "as *those of* the arm."
Page 178. Dr. MacLean informs me that the larva of *A. Iris* does not enclose itself *in*, but that it reposes on a web.

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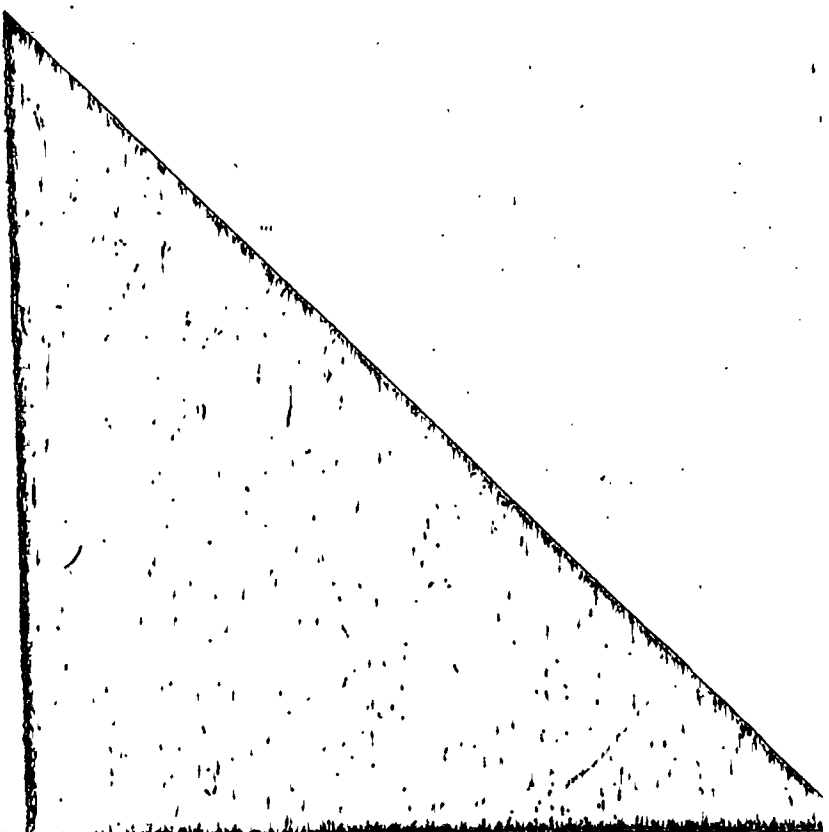

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